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# FINAL REPORT OF THE MISSOURI DIOXIN TASK FORCE

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## Appendices

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**submitted to  
Governor Christopher S. Bond**

**OCTOBER 31, 1983**



FINAL REPORT OF THE  
MISSOURI DIOXIN TASK FORCE  
Appendices

SUBMITTED TO  
GOVERNOR CHRISTOPHER S. BOND

October 31, 1983



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## APPENDIX I



## DIOXIN TASK FORCE MEETING

Senate Committee Room  
3rd Floor - Room 332  
State Capitol Building  
Jefferson City, Missouri

- I-7



## AGENDA

### DIOXIN TASK FORCE MEETING

July 21, 1983

Senate Committee Room  
3rd Floor - Room 332  
State Capitol Building  
Jefferson City, Missouri

- I. 9:00 a.m. Approval of Previous Meeting Minutes...June 16, Meeting
- II. 9:05 a.m. William A. (Art) Spratlin      Observations on Seveso,  
Deputy Director      Italy; Update on status  
Air and Waste Management Section      of EPA's dioxin related  
U.S. EPA, Region VII      activities
- III. 10:00 a.m. Alvin L. Young, Major, USAF, Ph.D.      Observations on Seveso,  
Specialist in Environmental Sciences      Italy.  
Agent Orange Projects Office  
Department of Medicine and Surgery  
Veterans Administration Central Office
- IV. 11:00 a.m. Frank J. Freestone      EPA's Mobile Incinerator  
Chief, Hazardous Spills Staff      and Soils Washer  
Oil and Hazardous Materials  
Spills Branch  
U.S. Environmental Protection Agency  
Edison, New Jersey
- V. 12:00      Lunch
- VI. 1:30 p.m. Dr. Raymond A. Suskind, M.D. (Tentative)      Health effects  
University of Cincinnati      of dioxin
- VII. 2:30 p.m. Discussion of Final Report
- VIII. 3:30 p.m. Discussion of Future Agendas
- IX. 4:00 p.m. Adjourn



## VERONA TRIP ITINERARY

August 10, 1983

1:00 p.m. Depart from the Springfield Hilton, 3050 N. Kentwood.  
Please meet in the lobby shortly before 1 p.m.

1:45 p.m. Arrive at the Syntex facility in Verona

3.45 p.m. Depart the Syntex facility for a short drive by tour  
of the Spring River area.

5:30 p.m. Return to the Springfield - Hilton Inn of the Ozarks

SMSU has provided a van which seats 15 people for the trip.  
Also, the earliest check-in time at the Hilton is noon.



## AGENDA

August 11, 1983

Southwest Missouri State University  
Campus Union  
Room 225, Parking Lot #7  
Springfield, Missouri

- 9:00 a.m. Approval of Meeting Minutes
- 9:05 a.m. Presentation - Spring River Dioxin Committee  
Jerard Losack - President  
Bill Davis
- 10:05 a.m. Presentation - Neosho City Officials  
Bill Beauvais - City Manager  
Jim Cole - Dir. of Public Works  
Jim Brock - Mayor
- 10:35 a.m. Break
- 11:00 a.m. Dr. Robert Hotchkiss Update on Health Studies  
Director  
Missouri Division of Health
- 12:00 p.m. Lunch at Wooden Nickel, 1514 South Glenstone, Springfield, MO
- 1:30 p.m. Subcommittee Discussions of Final Report
- 4:00 p.m. Discussions of Future Agendas
- 4:30 p.m. Adjourn

DIOXIN TASK FORCE MEETING

August 24 & 25, 1983

Department of Natural Resources  
Conference Room  
1915 Southridge Drive  
Jefferson City, Missouri

Wednesday - August 24, 1983

- I. 9:00 a.m. Approval of Previous Meeting Minutes...Aug. 11, 1983 Meeting
- II. 9:05 a.m. Discussion of EPA Dioxin Strategy Papers -  
Tom Clevenger, Acting Director  
University of Missouri - Columbia  
Environmental Trace Substances Lab
- III. 10:00 a.m. Update on Division of Health Activities -  
Robert L. Hotchkiss, MD.  
Director  
Missouri Division of Health
- IV. 11:00 a.m. Subcommittee Discussions
- V. 12:00 p.m. Lunch - Catered by High Street Deli
- VI. 1:30 p.m. Additional Subcommittee Discussion
- VII. 4:00 p.m. Discussion of Future Agendas
- VIII. 4:30 p.m. Adjourn

DIOXIN TASK FORCE MEETING

August 24 & 25, 1983

Department of Natural Resources  
Conference Room  
1915 Southridge Drive

Thursday - August 25, 1983

I. 9:00 a.m. Welcoming Remarks -

The Honorable Christopher S. Bond  
Governor  
State of Missouri

II. 9:10 a.m. Seveso Authority Officials

Dr. Umberto Fortunati Chief Scientist	scientific overview of Seveso decontamination/reclamation program
--	---

Alberto Piepóli, PE Chief On-Site Engineer	engineering aspects of actual cleanup
---	--

Dr. Vito La Porta Chemist	field sampling and quality assurance to validate cleanup
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III. 12:00 p.m. Lunch - At Das Stein Haus Restaurant

IV. 1:30 p.m. Seveso Authority Officials - Question and Answer Period

V. 3:00 p.m. Discussion of DNR Activities -

Linda James  
Assistant Director  
Division of Environmental Quality

VI. 3:30 p.m. Discussion of Current EPA Activities -

William A. (Art) Spratlin (unconfirmed)  
Deputy Director  
Air and Waste Management Division  
U.S. Environmental Protection Agency

VI. 4:30 p.m. Adjourn



TENTATIVE AGENDA  
DIOXIN TASK FORCE MEETING

September 8 & 9, 1983  
Jefferson City, Missouri

September 8, 1983

Senate Committee Room  
3rd Floor - Room 332  
State Capitol Building

- I. 9:00 a.m. Approval of Previous Meeting Minutes
- II. 9:05 a.m. Discussion of Final Report
- III. 12:00 p.m. Lunch - Phil E. Busters
- IV. 1:30 p.m. Additional Discussion of Final Report
- V. 4:00 p.m. Discussion of Future Agendas
- VI. 4:30 p.m. Adjourn

September 9, 1983

Department of Natural Resources  
Conference Room  
1915 Southridge Drive

- |  |   |
|--|---|
| I. 9:00 a.m. Armon Yanders, Director<br>Environmental Trace<br>Substances Center | Update on<br>University Research                              |
| II. 9:30 a.m. Castlewood Dioxin Task Force<br>Mr. Robert Bagley                  | Citizen concerns<br>about EPA's proposed<br>remedial actions. |
| III. 10:30 a.m. Break  |   |
| IV. 10:45 a.m. Discussion of Final Report  |   |
| V. 12:00 p.m. Lunch - Catered by High Street Deli                                |   |
| VI. 1:30 p.m. Additional Discussion of Final Report                              |   |
| VII. 4:30 p.m. Adjourn   |   |

## AGENDA

### DIOXIN TASK FORCE MEETING

September 20 & 21, 1983  
Jefferson City, Missouri

September 20, 1983

Department of Natural Resources  
Conference Room  
1915 Southridge Drive

- I. 9:00 a.m. Approval of Previous Meeting Minutes
- II. 9:05 a.m. Raymond A. Suskind, MD                      Health effects  
University of Cincinnati
- III. 10:00 a.m. John F. Quensen, Ph.D.                      Biodegradation  
Pesticide Research Center  
Michigan State University
- IV. 11:00 a.m. Richard Gaffney, Section Chief              Floodplain management  
Floodplain Management Section              issues - Times Beach and  
Department of Natural Resources              surrounding areas
- V. 12:00 - 1:30 p.m. Lunch at Nick's Homestead
- VI. 1:30 p.m. Discussion of Final Report
- VII. 4:30 p.m. Adjourn

September 21, 1983

Department of Natural Resources  
Conference Room  
1915 Southridge Drive

- I. 9:00 a.m. Discussion of Final Report
- II. 12:00 - 1:30 p.m. Lunch at Yen Chings
- III. 1:30 p.m. Additional Discussion of Final Report
- IV. 4:30 p.m. Adjourn

## DIOXIN TASK FORCE MEETING

June 16, 1983

Senate Committee Room  
State Capitol  
Jefferson City, Missouri

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:10 a.m. The minutes from the May 26, 1983 meeting were approved as submitted.

Tim Oppelt, Chief of the Incineration Research Branch of the U.S. Environmental Protection Agency in Cincinnati, Ohio, described some of the capabilities of their combustion research facility in Jefferson, Arkansas adjacent to the Pine Bluff arsenal and compared the research facility to the EPA mobile incinerator. Mr. Oppelt showed some slides of the research facility and explained the functions of the facility. He also briefly commented on the thermal destruction of TCDD.

Tom Clevenger, Acting Director at the Environmental Trace Substances Research Center at the University of Missouri-Columbia, then gave some background information on the Environmental Trace Substances Research Center in relation to the four university campuses throughout the state. He stated the university is available and willing to work with the state on the dioxin problems. Mr. Clevenger explained that the recent proposal received by the task force from the university was strictly preliminary, just ideas submitted by researchers from the campus. He also stated a decision would have to be made whether facilities should be set up within the state for research or whether we would rely on outside facilities. Mr. Clevenger suggested that the university could write a summary for the recommendations for research chapter of the final report.



Dr. John O'Connor of the University of Missouri-Columbia stated that we need professionals specifically trained in the area of solid and hazardous waste management so that society can deal with such incidents as the dioxin episode. One of the advantages of having a research and analysis facility at the university would be that the facility would be an educational tool and students would be working on problems that are meaningful to the State of Missouri.

Bernie Hartman, Metropolitan St. Louis Airport Authority, and Robert Flory, Booker Associates, Inc., then gave a presentation on the possibility of locating a reliever airport at Times Beach. Mr. Hartman stated that they had contracted with Booker Associates, Inc. to conduct a preliminary feasibility study to determine if there were any insurmountable problems with locating a reliever airport at the site. Mr. Flory pointed out the four issues they considered during their preliminary study:

1. Is there sufficient land available to support an airport?
2. Is the air space surrounding the area sufficient for the safe operation of aircraft?
3. Can the flooding problem be controlled to satisfy the requirements that FAA would impose upon the construction of such a facility?
4. Can the dioxin be properly contained so as not to impose a hazard upon the health of people using the area and the environment surrounding it?

The results of the preliminary investigation indicated that it is feasible to construct an airport at this location. There are some problems with respect to the air space (some areas where bluffs and trees penetrate the air space) surrounding the facility which could possibly require a waiver from FAA. The study indicated there would be adequate space for two runways in the area. The study also indicated that an airport at Times Beach could be compatible with the dioxin problem and that there would be support from FAA and EPA for such a facility and possibly some funding. FAA will not fund an airport that is in the 100-year flood plain; therefore, either a levee would have to be constructed or the airport would have to be built at elevation 450. The study proposed using the contaminated soil as fill, then capping it with a clay material, and then constructing taxiways, runways, and parking areas out of asphalt and concrete. The study also indicated that airport security would limit access to the contaminated site.

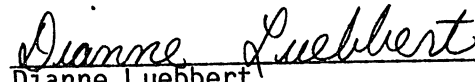
There was then discussion on dates and speakers for future meetings. Ray Susskind, Institute of Environmental Health, University of Cincinnati, is tentatively scheduled to speak at the July meeting. Another suggested speaker for the July meeting was an EPA representative, either Art Spratlin or Dave Wagoner. It was also suggested that someone tape the presentation by Dr. Ellen Silbergeld, Environmental Defense Fund, Washington, D.C., at the Eleventh Annual Missouri Waste Management Conference on July 18th and the task force would listen to the tape at a future meeting. It was also decided to discuss the CDC report from their blue-ribbon committee at the August 11 meeting if it was available.

A task force meeting was scheduled for August 11 to be held at Springfield, Missouri. On the afternoon of August 10, the task force members would visit the Verona site. Other future meeting dates are: August 24 and 25, September 7 and 8, and September 20 and 21.

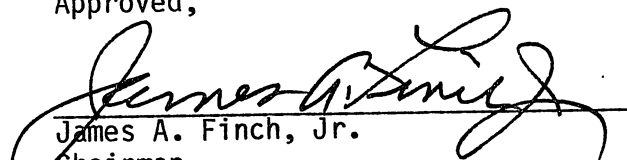
There was then some discussion on the final report due October 1, 1983. It was decided that the final report would be site specific. The task force decided to divide into two groups, one on health and one on remedial action, to make a list of issues they want to cover in the final report.

The meeting was adjourned at approximately 3:00 p.m.

Respectfully submitted,

  
Dianne Luebbert  
Secretary

Approved,

  
James A. Finch, Jr.  
Chairman

7/21/83  
Date

## DIOXIN TASK FORCE MEETING

July 21, 1983

Senate Committee Room  
State Capitol  
Jefferson City, Missouri

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:10 a.m. The minutes from the June 16, 1983 meeting were approved.

Dr. Alvin L. Young, Veterans Administration, gave a presentation on some of his observations on the Seveso, Italy accident that occurred in July 1976. Access to the site was limited by constructing a fence around the area and military guards were stationed around the area. A number of research projects have been undertaken to look at plant contamination and plant uptake of TCDD. Dr. Young also gave the results of some human health studies including neurological findings that have been done. He also discussed some of the environmental fate data of TCDD including: soil penetration, soil persistence, bioassay organisms/bioconcentration, bioavailability, and plant uptake. Dr. Young discussed some preliminary data released by the Veterans Administration in conjunction with the studies involving the spraying of agent orange in Vietnam in which they completed the biopsy of 33 men, approximately half of who served in Vietnam and half who did not. Twenty-five of the 33 were positive for TCDD at the detection limit. Dr. Young stated that this suggests that there may be background levels of TCDD in the human population. Dr. Young also discussed a study being conducted on ranch hands (men who were chronically exposed to herbicides in Vietnam). The death rates of the ranch hands were compared to death rates for normal white males in the same age group, for other enlisted men and for officers.

William A. (Art) Spratlin, Deputy Director, Air and Waste Management Section, U.S. Environmental Protection Agency, Region VII, then gave a presentation on the decontamination process, the cleanup process, the design of the basins, and the protective gear used by workers in Seveso, Italy. The concentration of some of the homes in Zone A was so high that they could not be decontaminated. These houses were demolished. Some of the houses in Zone A were decontaminated. All of the porous material (furniture, etc.) was landfilled.



The houses were then vacuumed with high power equipment, were washed inside and outside, and were then revacuumed. After retesting was done, the houses were repainted and the residents returned. Top soil from gardens and all streets and pathways in Zone A were removed and completely replaced. Decontamination of equipment left in the factory at Seveso is being studied by Seveso officials and Italian authorities. Mr. Spratlin then described the design of the basins being used for burial of contaminated material. The overall costs for the two basins is approximately \$100,000,000. He then described the protective gear used by the workers in the cleanup process.

Frank J. Freestone, Chief, Hazardous Spills Staff, Oil and Hazardous Materials Spills Branch, U.S. Environmental Protection Agency, Edison, New Jersey, then discussed what technologies might be available, such as extraction. He also described some of the projects they are trying to get EPA to fund to obtain more definite data on what the costs might be to cleanup soil contaminated with dioxin to some particular level. He then described their soils washings system and the mobile incinerator and the different stages of the process.

Ron Kucera, Department of Natural Resources, stated that the task force could request the department to draft a letter for Governor Bond's signature to William Ruckelhaus, Administrator, U.S. Environmental Protection Agency, Washington, D.C., requesting funding for such research needs as analytical procedures for testing the stacks of gases and requesting a test burn.

Some of the task force members who had traveled to Pine Bluff, Arkansas then briefly summarized some of their observations of the combustion research facility located at Pine Bluff.

It was then pointed out that the June 16, 1983 meeting minutes did not include the names of the individuals for the two subcommittees. They are as follows:

Remedial

Perry King (Chairman)  
Ray Forrester  
James Shaddy  
Sharon Rogers  
Robert Powell

Health

Carl Marienfeld (Chairman)  
George Roush  
Dwight Douglas  
Betty Wilson

Judge Finch stated he had received a letter from Jennie Solomon, Secretary of the Spring River Dioxin Committee, requesting that the task force attend a town meeting on the evening of August 10. It was decided to write Ms. Solomon a letter stating that an hour would be set aside on the August 11th agenda for someone from the committee to make a presentation at the task force meeting in Springfield on that date.

Dwight Douglas stated he had received a request from the City of Neosho to make a presentation at the August 11th task force meeting in Springfield. It was decided to set aside 30 minutes on the agenda for the city.

There was then some discussion on speakers for future meetings. The task force would like to have the Italian group speak at one of the meetings in August and also would like to hear from Dr. Ray Susskind and Dr. Ellen Silbergeld at one of the future meetings.

The task force will be meeting at the Hilton Inn in Springfield shortly before 1:00 p.m. on August 10th and will be touring the Verona site that afternoon. There will be a task force meeting the next day, August 11, at the Southwest Missouri State University Campus in Springfield.

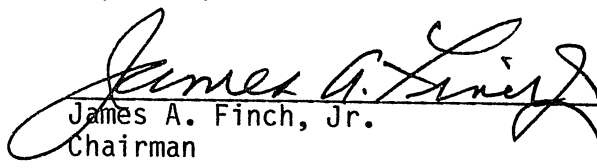
The meeting was adjourned at approximately 4:00 p.m.

Respectfully submitted,



Dianne Luebbert  
Secretary

Approved,



James A. Finch, Jr.  
Chairman

8/11/83  
Date

## DIOXIN TASK FORCE MEETING

August 11, 1983

Southwest Missouri State University  
Campus Union, Room 225  
Springfield, Missouri

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy

### ORDER OF BUSINESS

The meeting was called to order at 9:05 a.m. The minutes from the July 21, 1983 meeting were approved as submitted.

Dr. Gordon, President of the university, welcomed the task force to the Southwest Missouri State University campus.

The first presentation to the task force was made by members of the Spring River Dioxin Committee. Mr. Jerard Losack, President of the Spring River Dioxin Committee, stated that the main objective of the committee is to get the Spring River cleaned up. Mr. Losack stated the committee was concerned about the Syntex facility being built in the old river bed and might cause contamination of the Spring River. The committee is also concerned about dioxin moving into underground trenches in the area and causing contamination of water streams.

Joe Ruscha, a member of the Spring River Dioxin Committee, then discussed a handout compiled by the committee. The handout included various newspaper headlines and articles about dioxin in the Spring River area. He pointed out that some of the headlines were dated as early as 1971. One of the newspaper articles reported the first tests done on fish in the Spring River. He also went over some geologic maps of the area and discussed some of the fractures, faults and bedding planes of the area.

Steve Ruscha, a member of the Spring River Dioxin Committee, then discussed the different soil types and some of the characteristics of the soil in the trenches, burn site and old lagoon in the Verona area.

The Spring River Dioxin Committee made the following recommendations:

1. An immediate clean up of all dioxin contaminated sites on Syntex property and all other confirmed dioxin sites in the Verona area.

2. Further testing for dioxin in the Verona area including the following sites:
  - Spring River sediment and river life
  - The old Spring River channel
  - Buildings on Syntex property where workers or products may become contaminated by dioxin
  - Baldwin Park in Aurora
  - Water wells in the Verona and Aurora area.
3. Make public the results of all dioxin tests taken in the Verona area by Syntex and EPA.
4. Complete the Geological Survey of the Verona and Aurora area and make the results public.
5. Complete a health survey of area residents and make the results public.
6. Have all monitoring and testing done by EPA or DNR rather than Syntex.

The next speaker was Mr. Bill Davis of Verona. Mr. Davis had some comments concerning a presentation made to the task force by Dr. Thomas Satalowich of the Missouri Division of Health at the March 30, 1983 meeting. Mr. Davis indicated that he felt bovine leukemia was not the cause of the excessive cattle loss he has experienced recently.

Bill Beauvais, City Manager of Neosho, and Jim Cole, Director of Public Works for Neosho, then presented some of the problems the city has had with the three dioxin contaminated sites in Neosho. Mr. Cole stated that all three sites are secure and are no immediate health hazard to the public. The main question they face is who pays for the cleanup. The city would like for DNR and EPA to aid in the testing to find the exact locations. Mr. Cole stated the city had received a letter from EPA saying cleanup of the areas may require a permit for hazardous waste disposal. Mr. Beauvais requested that the task force encourage the Governor to have state agencies and EPA offer more assistance to communities such as Neosho who do not have the technical expertise that these other agencies have. He also stressed the fact that the city needs to know if the cleanup process would require a permit from EPA.

Dr. Denny Donnell, Missouri Division of Health, then brought the task force up-to-date on the current status of health interview work across the state. The Division of Health has been operating on a CDC cooperative agreement that ended July 12. They have made application for a new grant, which is in the process of being reviewed for approval. Dr. Donnell reported that Dr. Ray Susskind will speak at the September 20, 1983 meeting. Dr. Ellen Silbergeld will also be speaking at one of the future meetings. The group of Italians will be coming to the August 24 or 25 meeting.

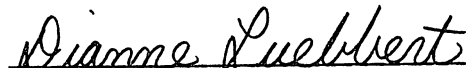


The task force decided that they needed to hear from William Ruckelhaus, Administrator, U.S. Environmental Protection Agency, or a representative from his office to find out if permits would be required for cleanup processes.

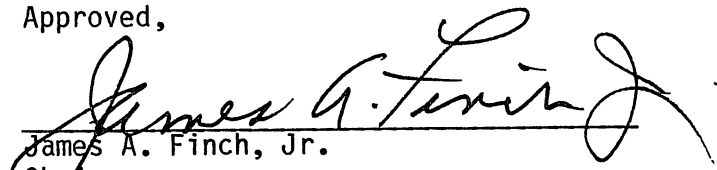
The task force then divided into the health subcommittee and the remedial action subcommittee and discussed what would be included in the final report. It was also decided to request an extension on the deadline for the final report to December 1, 1983.

The meeting was adjourned at approximately 4:00 p.m.

Respectfully submitted,

  
Dianne Luebbert  
Secretary

Approved,

  
James A. Finch, Jr.  
Chairman

8/25/83  
Date

## DIOXIN TASK FORCE MEETING

August 24, 1983

Department of Natural Resources' Conference Room  
Jefferson City, Missouri

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:10 a.m. The minutes from the August 11, 1983 meeting were approved as submitted.

Tom Clevenger, Environmental Trace Substances Lab, University of Missouri - Columbia, discussed the EPA dioxin strategy papers. There were three papers: one on air, one on water, and one on health effects. Dr. Clevenger had attended the peer review session for the documents and had asked the group the following questions:

1. Would the information presented by Al Young on adipose tissue be included in the document? The group answered that the information presented by Al Young was valid and probably would be included in the document.
2. Al Young had also presented some information that showed a higher rate of chloracne among youth. Could youth be more sensitive to dioxin than adults? There were two Italians present who answered this question. They thought there was a higher rate among youth because there was higher exposure (playing in the dirt, etc.). They did not think youth were more sensitive.
3. Stated concern that there was very little information on Missouri analysis included in the document. The group stated that they did want to get some information concerning a statement on precision and accuracy in the document.

Dr. Clevenger also stated that there was discussion among the group on what information should be included in the document. They decided that they would not consider any information that was not peer reviewed. Any information that is available to the public is considered peer reviewed.

Robert Hotchkiss, Director, Missouri Division of Health, then gave an update on some of the Division of Health activities. The study on the 112 individuals in eastern Missouri is in the process of being drafted. This is not going to be a definitive study. It will not say anything about whether 1 ppb is an adequate level of safety. He also stated that Dr. Renata Kimbrough is in the process of redrafting her statement paper, but that she did not think that the 1 ppb level in residential sections would change. Dr. Hotchkiss also announced that Dr. Ellen Silbergeld would not be able to come to any of the September meetings, but that she would be glad to review any material for the task force.

Dr. Denny Donnell, Missouri Division of Health, stated they would be going to Cincinnati in early September to discuss with NIOSH any further developments in the study in southwest Missouri which would probably result in a joint effort with NIOSH to more carefully study the group of people who had originally been involved in the production that led to the dioxin.

Dr. Donnell also stated he had learned from EPA of two new dioxin sites in eastern Missouri.

1. Bull Moose Tube Manufacturing Company in Franklin County in the vicinity of 29 ppb.
2. Community Christian Church in Manchester in the vicinity of 1.9 - 9.2 ppb with the higher levels under an asphalt cover and the lower levels are in a ditch alongside the highway in front of the church.

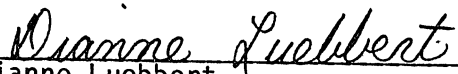
Dr. Donnell also announced that Dr. Richard Hoffman, a physician epidemiologist, will be working with the Division of Health on materials relating to dioxin beginning around September 19.

The task force then discussed agendas for future meetings. Dr. Ray Susskind will be speaking at the September 20 meeting. There was then some discussion on whether or not to hear from someone on biodegradation. It was decided to try and get Dr. Quensen from Michigan to speak at one of the meetings in September. If Dr. Quensen is not able to come, it was suggested to try and get Dr. Chakravarty from Illinois. It was also announced that the letter asking William Ruckelhaus, Administrator, U.S. Environmental Protection Agency, to speak to the task force was not sent.

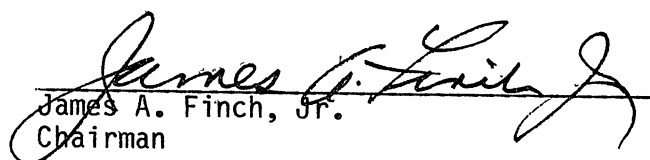
The dates for the next task force meetings were changed from September 7 and 8 to September 8 and 9.

The task force then broke up into the remedial action and health subcommittee groups for discussion on the final report.

Respectfully submitted,

  
\_\_\_\_\_  
Dianne Luebbert  
Secretary

Approved,

  
\_\_\_\_\_  
James A. Finch, Jr.  
Chairman

9/9/83  
Date/

## DIOXIN TASK FORCE MEETING

August 25, 1983

Department of Natural Resources' Conference Room  
Jefferson City, Missouri

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:00 a.m.

Governor Christopher S. Bond welcomed the delegation of Italian officials from the Seveso project and thanked them for making the trip from Italy to share their experiences in Seveso in the area of dioxin contamination and reclamation. Governor Bond also expressed his thanks to the members of the task force. He stated that the entire United States was waiting to see how Missouri will solve the dioxin problem. The purpose of the task force is to evaluate information about dioxin, its health effects, its behavior in the environment and to recommend a method which safely and economically removes the threat of dioxin from the environment. The major issues of concern to the task force and to the Governor include: the environmental safety of the disposal method, the measures taken to protect the workers in the process, and the public and the environment during excavation of the contaminated material.

Robert Schreiber, Director, Division of Environmental Quality, then gave an update on DNR activities. The basic activity at present is trying to get the families out of the Minker area. The residents want to be bought out and were not interested in a dust suppressant being applied. He stated that EPA has taken actions at Castlewood. They are putting down a material to control dust along the roads and yards. This is a short term solution to a potential dust problem. He stated they may use high efficiency vacuum sweepers at Mr. Minker's house. Linda James stated she would have some slides on the operation



of the sweeper before they were sweeping and after they were sweeping at Castlewood. She stated the material was swept into drums and stored securely in trucks at Castlewood. The task force expressed some concerns about what is being done at Castlewood.

Colonel Al Young, Veterans Administration, then introduced the three Italians. Dr. Umberto Fortunati was the chief scientist for the Seveso cleanup program. Alberto Piepoli was the chief on-site engineer and Dr. Vito La Porta was the chemist in charge of field sampling.

Dr. Fortunati discussed some of the scientific overview programs, the issues, and how they had to look at the various options. After the factory accident in 1976 the Italian government started a crash program to analyze the soil and try to determine what substance was present. The first political decision made by the government was to locate its office to coordinate cleanup and reclamation operations in the town of Seveso itself. The Seveso office was organized into five programs: (1) reclamation program, (2) epidemiologic program, (3) agricultural program, (4) construction program, and (5) social security program. A regional law was prepared which outlined steps to be taken and basic foundations of the cleanup operation. The first cleanup option they looked at was incineration. The main reason for not building the incinerator was citizen opposition. Another cleanup option looked at was degradation by microorganisms. They have done a lot of research on this and have not found a single microorganism capable of degrading TCDD. They have also done tests using ultraviolet light, but found that the system did not work beyond a certain thickness where the light could not go or where the chemical solution could not penetrate. Another cleanup option was extraction with solvents. They decided against extraction because it was not sufficient to get down to the value they wanted, they needed to use two solvents, and there would be a maintenance problem with a mechanical device that would put the solvent in contact with the soil. They also looked into the possibility of degradation by gamma rays. They abandoned this idea because of the danger to workers who would operate such a machine. After looking at all these options, the officials decided that the best solution was to collect all the contaminated material in the most highly contaminated area and put it in a basin with proper isolation and proper sealing. The relatively low level contaminated area would be cleaned up and returned back to the population.

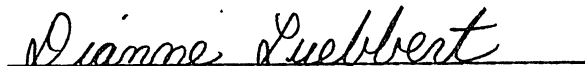
Dr. Vito La Porta then discussed field sampling and described the cleanup process. The first problem in the cleanup was to find out the value of furniture. Each piece of furniture had to be either cleaned or destroyed. If it was destroyed, it had to be refunded. After everything was taken out of the buildings, they were vacuumed, cleaned and washed with water and detergents. The buildings were then sealed off and decontamination was started outside the buildings and the gardens.

Mr. Alberto Piepoli then discussed some of the engineering aspects of the cleanup operation. All of the cleanup workers had to have experience and had to be in perfect health. He described the protective gear worn by the cleanup workers and described some of the other precautions taken to protect the workers. Mr. Piepoli also described the design and construction of the two

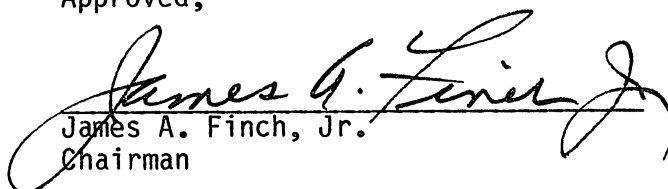
basins used to store the contaminated soil and materials. The most highly contaminated material was put in the center of the basin and on the outsides put the materials with lower concentrations. The cost for the basins was \$90 per cubic meter. This did not include the costs of the protective suits.

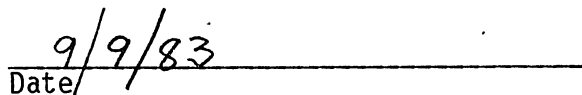
The meeting was adjourned at approximately 3:30 p.m.

Respectfully submitted,

  
Dianne Luebbert  
Secretary

Approved,

  
James A. Finch, Jr.  
Chairman

  
Date

## DIOXIN TASK FORCE MEETING

September 8, 1983

Senate Committee Room  
State Capitol  
Jefferson City, MO

### MEMBERS PRESENT

James Finch, Chairman  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:30 a.m. The minutes from the August 24 and August 25 meetings were approved as submitted.

Robert Schreiber announced that Morris Kay, Regional Administrator, U.S. Environmental Protection Agency, Region VII, would be speaking to the task force at the next day's meeting at 8:00 a.m.

Robert Schreiber then discussed several items with the task force, including whether the CDC report on health studies would be available by the September 20 meeting. Mr. Schreiber also discussed the reasons for the department's request to consolidate all the contaminated sites into one site. Mr. Schreiber then stated that EPA, Region VII, would not require RCRA permits for remedial actions at sites, such as Neosho where the material is stabilized by storing it in place. The state also would not require permits for stabilization in place. If there would be one centralized facility, this would be a hazardous waste management facility and would require either a storage permit or a disposal permit. Anytime material would be moved outside of a reasonable geographic boundary, this would require a permit. Movement of the material off-site would also require a generator permit and a transporter license. It was estimated that it would take at least one year to get a storage permit. Mr. Schreiber also stated that by June of next year, there is a high probability that dioxin will be a federally listed hazardous waste and would then be subject to RCRA activity.

The task force then broke up into the remedial actions and health subcommittee groups and worked on the final report.

In the afternoon session, Robert Schreiber briefed the task force on current EPA plans for the Minker site. He summarized a meeting he had attended with Fred Lafser on September 2 at Region VII with Morris Kay and Art Spratlin. They discussed the five options for initial remedial measures at the Minker site as described in a report prepared for EPA by CH<sub>2</sub>M Hill. The five options were:

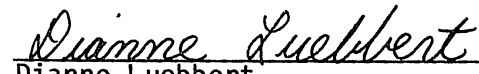
1. Stabilization in place with a permeable geotextile fabric
2. Stabilization in place with an impermeable polyurethane cover
3. Consolidation on site in a monofill with an earthen embankment
4. Consolidation on site in a monofill within a concrete vault
5. Consolidation on site within a freestanding monofill.

Total costs for the above measures ranged from \$2.1 to 4.5 million. In the case of options 3, 4 and 5, long term monitoring costs to the state would be \$150,000 to \$200,000 annually. Mr. Schreiber indicated that the information contained in the report would be presented by EPA to the residents of the Minker area during a public meeting in St. Louis that evening.

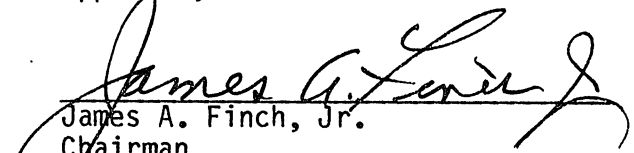
Robert Powell then briefly described the highlights of the dioxin symposium he attended as part of the annual American Chemical Society meeting in Washington, D.C. during the week of August 29.

The task force then divided into the two subcommittee groups for the remainder of the afternoon.

Respectfully submitted,

  
Dianne Luebbert  
Secretary

Approved,

  
James A. Finch, Jr.  
Chairman

9/20/83  
Date

## DIOXIN TASK FORCE MEETING

September 9, 1983

Department of Natural Resources' Conference Room  
Jefferson City, MO

### MEMBERS PRESENT

James Finch, Chairman  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at approximately 8:00 a.m.

Morris Kay, Regional Administrator, U.S. Environmental Protection Agency, Region VII, discussed some of the EPA activities concerning the Minker/Stout site. A meeting had been conducted the previous evening for the people of that area. The purpose of the meeting was to present to the people five potential options for their review and provided a 30-day comment period. Mr. Kay stated that one of the concerns of his administration is a sensitivity to the people who have been directly affected by the dioxin problem and that they have tried to establish good communications with the people. Mr. Kay made a recommendation to the task force that a part of the final report state that the federal government, state government and local governments work together to help establish public confidence and public trust. He also recommended that state laws and federal laws be reviewed and changes made so that if in the future there is another problem such as the dioxin problem we would be able to move more quickly and effectively in dealing with the problem. Mr. Kay stated that one of the reasons they have made a proposal to stabilize the material at the Minker site is because under the National Contingency Plan, EPA has a responsibility to prevent migration from the site and there has been some indication of migration to Romaine Creek.

Mr. Wally Smith, a spokesperson from Castlewood, then stated to Mr. Kay his concerns about the meeting the previous evening. He said the people were handed a book that they could not understand.

Fred Lafser, Director, Department of Natural Resources, commented on several current issues of concern. He explained the importance of trying to rank all of the sites as one under EPA's Superfund law. This would allow the state to receive funding for cleanup of all the sites, as well as promote a unified approach to cleanup. He stressed that if the task force's recommendations include a centralized storage facility, it would be the state's responsibility

to find a site and get the necessary permits. He also suggested that the task force prepare comments on EPA's Initial Remedial Measures Study for the Minker site. Finally, he suggested that the task force develop a long term strategy to deal with the dioxin problem in general.


Dr. Armon Yanders, Director, Environmental Trace Substances Lab, University of Missouri-Columbia, presented a document to the task force entitled "The Missouri Program in Toxicology." The document described what kinds of things needed to be done in the toxicology program in the state. Dr. Yanders, Dr. Clevenger, James Long, and John Crellin had visited several laboratory facilities throughout the country where hazardous chemical work was being done to see what would be required in Missouri. The document presented covered five sections: (1) Statement of Problem, (2) What Is Needed, (3) What Is Now Available, (4) Possible Location for the Program, and (5) The Future. The facility itself would cost \$7 million with a yearly operating cost of \$2 million.

Robert Bagley, a member of the Castlewood Dioxin Task Force, discussed some of the concerns of the residents of Castlewood. He discussed how dramatically the lives of the residents have changed since the discovery of dioxin at Castlewood. The worst problem has been not knowing what is going on, not being informed. The residents are not in favor of a bunker being constructed in the town. The residents would like to be bought out so they can start their lives over again. Wally Smith stated they were told by EPA that they would be informed of EPA's next step on October 1.

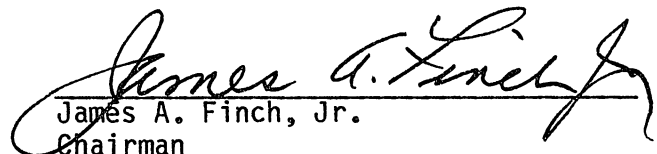
The task force decided to have a final draft of the report ready before October 19. They will then meet on October 19 and make any final changes or corrections. The final report would then be delivered to the Governor's Office and sent to the printers by November 1, 1983.

In the afternoon the task force broke up into the remedial actions and health subcommittees to work on the final report.

Respectfully submitted,

  
Dianne Luebbert  
Secretary

Approved,

  
James A. Finch, Jr.  
Chairman

9/20/83  
Date

## DIOXIN TASK FORCE MEETING

September 20 and 21, 1983

Department of Natural Resources' Conference Room  
Jefferson City, MO

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:15 a.m. The minutes from the September 8 and September 9, 1983 meetings were approved as submitted.

Dr. Robert Hotchkiss introduced Dr. Raymond Suskind, University of Cincinnati. Dr. Suskind discussed some of the effects of the manufacture of 2,4,5-T and discussed some of his experiences concerning the incident at Nitro, West Virginia that occurred in March, 1949. Dr. Suskind summarized the following points concerning the Nitro incident:

1. A significant long term effect that was found was that there was persistent chloracne.
2. Some suggestive long term effects were:
  - a. Abnormal pulmonary function in current smokers who were exposed as compared with current smokers who were not exposed.
  - b. There appeared to be an increase in frequency in history of gastrointestinal ulcers among those exposed.
  - c. There appeared to be an increase in the frequency of low HDL (high density lipoproteins) levels among those exposed with persistent chloracne.
3. In this study, which involved only a small population, there appeared to be no increase in the risk of diseases of the cardiovascular system, abnormalities of the liver, nerve function, susceptibility to infection, and no effects on reproduction or fetal development.

David Bedan introduced Dr. John Quensen, Pesticide Research Center, Michigan State University, who has been involved in research on microbial degradation of dioxin. Dr. Quensen stated the following conclusions:

1. Possible to partially degrade TCDD in broth culture.
2. TCDD is persistent in soil environment because:
  - a. There are no suitable microorganisms in most soils.
  - b. Dioxin is degraded by a cometabolic process only.
  - c. Dioxin is not readily available for cellular uptake because it binds tightly to the soil.
3. Development of an in situ microbial treatment process is unlikely at this time.
4. A system to microbially degrade dioxin in the soil is likely to involve:
  - a. Containment
  - b. Mobilization with solvents
  - c. Cometabolism
  - d. Inoculation with mixed cultures and/or genetically engineered microorganisms and carefully controlled conditions.
  - e. Dechlorination
  - f. Several years to reduce dioxin level in soil to a safe level.

Richard Gaffney, Section Chief, Floodplain Management Section, Department of Natural Resources, showed some slides of the December flood in the Eureka and Times Beach areas. He also discussed some of the floodplain issues in Times Beach and the surrounding areas.

Robert Powell then briefed the other members of the task force about some of the concerns of the Castlewood residents that were relayed to him at a meeting the previous evening. These concerns were:

1. They perceive a lack of communication between EPA and DNR.
2. They want an independent evaluation of the effectiveness and safety of the spraying of material to control dust.
3. They would like for the task force to recommend or identify a centralized storage facility.
4. They do not want an on-site temporary storage facility or a bunker at Castlewood. They are concerned about the psychological effects and the economic impact of such a facility on the residents.
5. They want either temporary relocation and/or buy out.
6. They are concerned about the economic provisions that are made for people in non-contaminated adjacent areas, in particular that their property values are maintained.
7. They are concerned about the registry letter for contaminated sites that they received. This letter caused a tremendous psychological effect on the residents who received them.
8. They are interested in receiving some type of compensation from loss of income as renters move out.

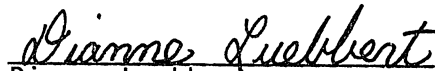


9. There is concern about people not being able to use their property to get a loan because of all the publicity surrounding the property. They are interested in finding out if there could be any low income government loans for people who need to borrow money.

The task force will meet on October 24, 1983 to make further changes and recommendations for the final report. They will meet again on October 31, 1983 to present the final report to the governor.

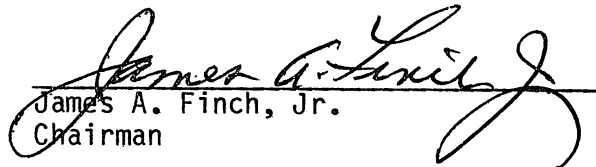
The task force worked on the final report for the rest of the day and on the following day, September 21.

Respectfully submitted. .



Dianne Luebbert  
Secretary

Approved,



James A. Finch, Jr.  
Chairman

10/24/83  
Date

## DIOXIN TASK FORCE MEETING

October 24, 1983

Department of Natural Resources' Conference Room  
Jefferson City, MO

### MEMBERS PRESENT

James Finch, Chairman  
Dwight Douglas  
Ray Forrester  
Perry King  
Carl Marienfeld  
Robert Powell  
Sharon Rogers  
George Roush  
James Shaddy  
Betty Wilson

### ORDER OF BUSINESS

The meeting was called to order at 9:20 a.m. The minutes from the September 20 and 21, 1983 meeting were approved as submitted.

Judge Finch stated that the Task Force had been compiling material from working drafts and that the Task Force had not voted on any of the drafts as a whole. There was then discussion on whether the final report should have two sections (health and remedial action) or whether the two sections should be combined into one. It was decided to have two separate sections.

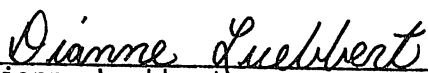
Fred Lafser, Director, Department of Natural Resources, stated that the Task Force would present their final report to Governor Bond at 1:00 p.m. on Monday, October 31, 1983. Mr. Lafser also stated that Governor Bond had met with William Ruckelhaus, Administrator, U.S. Environmental Protection Agency. Mr. Lafser felt confident that EPA is looking for recommendations from the Task Force and that EPA would try as much as possible to work with the state toward recommendations made by the Task Force. There was then some discussion on what was meant by "strategy". Mr. Lafser also stated that there was some advance publicity the previous week on the cost of a storage facility. The \$200,000,000 figure given was inappropriate. A figure cannot be given until detailed engineering bids are received. Based on experiences in Seveso, Italy, the cost would be approximately \$70 per cubic yard. Assuming 500,000 cubic yards of contaminated soil, total costs of removal, transportation and construction would probably be about \$35,000,000-\$40,000,000.

The Task Force spent the remainder of the day working on the final report. The Task Force will meet at 9:00 a.m. on Monday, October 31, 1983, at the DNR conference room to make final changes to the report which will be presented to the Governor that afternoon at 1:00 p.m.

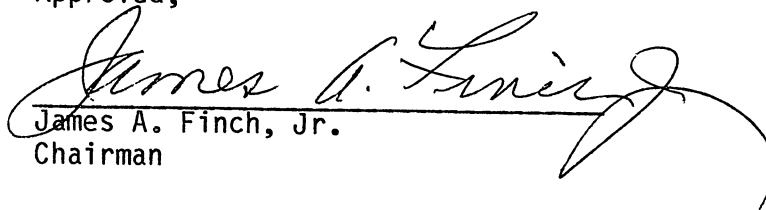
Fred Lafser also gave an update on the latest information from FEMA on the Times Beach buy outs.

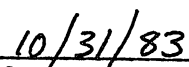
The meeting was adjourned at approximately 5:15 p.m.

Respectfully submitted,

  
\_\_\_\_\_  
Dianne Luebbert  
Secretary

Approved,

  
\_\_\_\_\_  
James A. Finch, Jr.  
Chairman

  
\_\_\_\_\_  
Date

## APPENDIX II



## APPENDIX II

### SUMMARIES OF EXPERTS' PRESENTATIONS

Tim Oppelt  
Chief, Incineration Research Branch  
Office of Research and Development  
U.S. Environmental Protection Agency

The Incineration and Research Branch is primarily responsible for examining the behavior of hazardous wastes, as regulated under RCRA, in thermal destruction systems, including full scale commercial incinerators, cement kilns, and industrial boilers. The research is conducted from very small scale to very large scale and much is done outside of the agency through grants and contracts with other institutions. Mr. Oppelt first described the capabilities and flexibility of the EPA's Combustion Research Facility (CRF) in Jefferson, Arkansas. Then the CRF was compared to the EPA mobile incinerator which is run out of a different office. Mr. Oppelt then covered what is presently known about thermal destruction of dioxin and what needs to be done to examine the viability and parameters for incineration of dioxin off of soil materials.

The CRF is located in a remote part of Arkansas about 35 miles south of Pine Bluff, on the grounds of the Food and Drug Administration's National Center for Toxicological Research. The objectives for the facility are to do waste destruction performance tests on both liquid injection and rotary kiln incinerators. The data collected will support EPA and State permitting under RCRA, predict performance of incinerators that have not been tested, find out what causes incinerators not to work, and be used to look at control systems, materials handling, and emissions measurements. The facility consists of the incinerator testing room where both units will be located, laboratories for analysis of waste, screening of waste, and analysis of combustion products, a control room, and a locker and shower area. The facility does not have gas chromatograph/mass spectrometer (GC/MS) capability at the present time. While the unit is operating, the only way to enter the combustion room is through the locker and wash up area.

The flow diagram is typical of other rotary kilns in the United States. The kiln itself is followed by a secondary combustion chamber or afterburner, a venturi scrubber and absorption tower for removal of particulates, and an induced draft fan and stack. The facility was designed to handle sludges, slurries, and liquids, with later plans to add solids handling capabilities. So to handle soil a new feed system would be needed, and also the ash handling capacity would have to be increased, which could take 6 to 9 months once the money is obtained. The kiln capacity is 200 to 250 pounds per hour. Maximum operating temperatures are 2500°F in the lower chamber and 2700°F in the afterburner. A dry scrubber system would be adequate for dioxin soils due to the low chlorine content, which would eliminate the need to handle contaminated scrubber water.

In comparison, the EPA mobile incinerator has about ten times the capacity of the CRF and can feed liquids or solids. The afterburner normally is operated at 1800°F but can run up to 2200°F. The main difference in the equipment is the air pollution control unit. The mobile incinerator has a moving belt filter and absorber for HCL which could be run dry (without the absorber). The primary difference in the use of the two facilities is the mobility of the incinerator versus transporting the soil to the CRF. It is felt that either unit could adequately perform a pilot scale burn.

The available data on thermal destruction of 2,3,7,8-TCDD is not definite, as estimates range from 1500°F to 2700°F. The higher temperature was used to incinerate herbicide orange. Dichloro- and trichlorodibenzo dioxins have been examined, and it is felt that they are only slightly more stable than PCB's. Dr. Rappe of Sweden and others have said that thermal decomposition of tetra-chlorinated dioxins would be similar to di- and trichlorinated dioxins. However, there is very little information available on thermally desorbing dioxin off of soils. This type of test could be done in the laboratory, essentially to see what temperature is required to "bake" dioxin off of soils. Such a facility exists at the University of Dayton Research Institute which has analyzed about 60 hazardous compounds under contract to EPA. It has a thermal reactor directly coupled to a GC/MS with very low detection limits.

An important concern of incinerating wastes are products of incomplete combustion (pic's). During testing, looking for the disappearance of a particular compound is not enough. The resulting gases must also be checked for the appearance of environmentally significant compounds. Testing would also determine rotation and feed rates, particle size of feed, residue and ash quality, and basic combustion parameters such as excess air, fuel, and temperature.

In summary, a progression to pursue incineration would be to first define temperatures and times for thermally desorbing materials off of soils, then pilot scale tests should be conducted at an intermediate scale incinerator such as the CRF or mobile incinerator.

(This summary has been prepared from the transcript of the June 16th Task Force meeting).

Alvin L. Young, Lt. Col., USAF, Ph.D.  
Specialist in Environmental Sciences  
Agent Orange Projects Office  
Department of Medicine and Surgery  
Veterans Administration Central Office  
Washington, DC

This summary had not been received at the time this report was published. For a brief description of Dr. Young's speech, please see Appendix I.

Mr. Frank J. Freestone  
Chief, Hazardous Spills Staff  
Oil and Hazardous Materials Spills Branch  
U. S. Environmental Protection Agency  
Edison, New Jersey

Mr. Freestone covered available technologies to handle dioxin other than containment, such as incineration or extraction, and also explained work done through his office.

Mr. Freestone's group is responsible for contributing to technologies for assessment and clean up of waste sites. It is preferable to go to the source when possible, as opposed to cleaning up wastes that have been spread throughout the environment. Excavation of buried material is very labor intensive and can be done only with crude technological methods, causing a waste of manpower.

A primary purpose is to define what is available in each of several technology areas to evaluate commercially available alternatives to determine if improvements are necessary. If improvements are shown to be necessary, prototype equipment may be developed and tested or manuals may be developed. The primary product is information aimed at such things as unit costs for technologies.

Examples of equipment produced are, a device to detect instability in earthen dikes, a mobile personnel decontamination station, a mobile laboratory, a mobile soils washer prototype, and the EPA mobile incinerator. The soils washer is used with either organic or water-based solvents. However, even in laboratory conditions, 90% is the maximum amount of dioxin desorbed off of soils. This sheds unfavorable light on the possibility for solvent extraction of soils in Missouri.

The EPA mobile incinerator is currently reporting 99.9999% destruction of PCB's. It does have a solids feed mechanism. The solids feed rate would be affected significantly by the water content of the soil. The basic units of the incinerator fit on 3 flatbed trailers, with others required for the monitoring system, decontamination facilities, office, etc. Estimates for use of a similar facility are on the order of 600 \$/ton, with a significant portion being operational costs. It is felt that a test burn on dioxin contaminated soils using the mobile incinerator could constitute the necessary performance tests; however, a laboratory scale test would be the desired first step.

(This summary has been prepared from the transcript of the July 21st, Task Force meeting.)

Morris Kay  
Regional Administrator  
Region VII, U.S. Environmental Protection Agency  
Kansas City, MO

I want to thank you very much for taking time from your final report to hear me. You have a say in how the dioxin issue is handled in this state. You are charged with a tremendous responsibility. I think I have some insight into



the broadness of that responsibility and difficulties of that responsibility. And I noticed that your goal is to come up with that final solution. I am going to be the first to compliment you as soon as we see that final solution and the difficulties attached.

The measures that our agency is involved in in working with the MDNR, working with the local units of government, and indeed working with the people at the local level have proven to me again, as I have many years of experience in other areas, seen that we cannot just approach these issues without some sensitivity to the people that are directly involved. We conducted a meeting last evening in Jefferson County. I had a conflict and could not be there, but my staff gave me a report of it. There were about 125 in attendance. The purpose of the meeting was to present to the people locally, in that local community, some potential options for their review and we're providing a 30-day comment period. Just some options that we had an engineering firm develop for interim, very temporary, stabilization of the Minker area. Going back to your Commission's report, interim report, in which you proposed stabilization of the Minker area, we have followed through on that and attempted to expedite not only the buy out as proposed, but to also develop some methods for stabilization. The purpose of last night's meeting was to present those options to the people at the local level and allow them the opportunity to review them.

I think we all feel very sensitive to the people at local levels. Those people who have had their health affected, or they have concern for their health, or they have concerns for their family's health, or they have had their property values affected. That has to be a serious concern of all of us as it is to them. We are looking for ways to help. I think it is important that we in government at every level recognize that we do not have all of the answers, but we are looking for ways to help them. It is, and I think it goes without saying, that there are a number of areas that the government is researching today. We are researching the dioxin issue. Congress has recently appropriated additional sums of money. We have put in excess of \$6 million into dioxin research. We don't know everything there is to know about dioxin. We don't know how to dispose of dioxin contaminated soil and neutralize the dioxin on a long term permanent basis. We don't have that information at this time at the federal level. Perhaps this task force in its report next month will be able to shed some light on that final solution. We are optimistic as I know you are. We are, I think, at the federal level at every instance desirous of working closely with the state level government, the people at the local level, counties, cities, and indeed the citizens themselves. We have made every effort to establish communications, keep the dialogue going, communicate to the people, try to let them know what we at the government level are capable of doing. There are some things obviously that we do not have the resources nor the scientific ability to do. Truly in this country today the scientific ability to create the chemical substance dioxin exceeds the scientific ability to know exactly what to do to dispose of it. Dioxin may not be the final issue in our lifetime. There may be an additional issue such as dioxin some where down the road. We don't know that. I think its important that we handle this one properly so that we may be prepared and perhaps learn, if you will, from our experiences of this process to be applicable to the future.

As I indicated, one of our primary concerns at the federal level, one of my primary concerns of this administration, is the sensitivity to the people who have been directly affected. I recognize that when you find dioxin on somebody's property, and that becomes known to the people first, we hope, who's property is directly being affected, that has not always been the case, but that's what we try. And then it becomes public knowledge and those people become almost under a microscope, the neighbors viewing them, and sometimes there are instances such as occurred in Times Beach, some type of sudden change to the different, something where the kids themselves go to school and say the other children won't play with us anymore because we have dioxin. There is so much misinformation being communicated to the people and I think we at every level of government have the responsibility to work together to try to prevent the misinformation and I think that part of doing that is letting the public know, the people who are directly affected by dioxin, exactly what we think we do know, exactly what we think we don't know, and what our capabilities are.

I would like to recommend to the task force that a part at least of your final report include something, whether it be a statement or a commitment at least, to work together with the federal level, state level, local units of government to help establish a public confidence and public trust that is needed for any federal agency or state agency or local agency of government to be able to deal with a problem of the magnitude of the dioxin problem in Missouri. I think that team work is critically important to establish that type of level of public trust, that is needed.

I think it would be appropriate to review state laws and state regulations as well as federal laws and federal regulations to make recommendations. You had an opportunity to review and see perhaps from the inside and the outside objectively what some of the problems have been. It would be appropriate to make recommendations for changes in our laws so that in the future if there is another problem of the magnitude of the dioxin problem, we would be able to move quickly and effectively in dealing with that problem and in dealing directly with the people that are affected.

We at the federal level are working on the Superfund law and we are working on the latest contingency plan. One of the reasons we have made a proposal to stabilize the material at the Minker Site is that because of the National Contingency Plan we have a responsibility to prevent migration of contaminated soil off of that site. Clearly, we have information indicating that there has been migration of the original soil from where it was placed at the Minker home down all the way to Romaine Creek. The area itself geologically certainly is suspect from the standpoint that the geology is very karst, the possibility is certain that the contaminated soil if it is just left right there in place untouched, unmanaged, would migrate further and could even migrate into the limestone. We have that concern, a concern for protecting the people who have not all moved from those sites. And that is another issue that we have found when we have offered relocation and buy out, a voluntary buy out, and it has always been voluntary, that most people simply do not want to leave their homes or they recognize the health problem if they don't leave their homes, but they don't want to, and the first opportunity, their first choice, is to stay. It's their property and in some instances they built it with their own efforts. They created the property and the property values. They don't want to see those diminish and we are sensitive to that.

I think the recommendations that I have just made, a review of the state laws, the federal laws, an attempt to streamline them if you will so that we can, through our contracting arrangements, through our procurement arrangements, be able to respond quickly in any instance such as the dioxin problem. Well I'm not here to lecture to you. I'm very delighted to be here and I felt that it was important to have this opportunity to share some views and I appreciate the time you have taken to move your schedule forward this morning to accommodate my schedule. I am going to St. Louis this morning to meet with a group of realtors and leaders to discuss the things and some of the problems and try to define the problem if you will in relation to the deterioration of market values in a dioxin site so that the people themselves who are directly affected and owners of the property perhaps would not suffer as much and to determine if there are things that we can do to prevent them from taking a financial loss. I want to at this time, if its agreeable to you, to respond to questions and I am very interested in hearing what the group has to say and any recommendations you may have.

(The remarks above were transcribed from a tape of the September 9th, Task Force meeting.)

Raymond Suskind, MD  
University of Cincinnati

This summary had not been received at the time this report was published at the time this report was published. For a brief description of Dr. Suskind's speech, please see Appendix I.

J.F. Quensen, III  
Pesticide Research Center  
Michigan State University  
East Lansing, MI 48824

#### MICROBIAL DEGRADATION OF TCDD

Two species of soil microorganisms, Bacillus megaterium and Nocardiopsis sp., partially degrade 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in broth cultures containing 5 ppb of the compound. This occurs during a one week incubation period under aerobic conditions at room temperature in the dark. We believe our results are highly significant because the rate of degradation is much greater than previously reported. Also, we have separated three metabolites by thin layer chromatography, whereas only one microbial metabolite (1-hydroxy-2,3,7,8-TCDD) has previously been identified (Philippi et al., Experientia 38:659 (1982)).

The amount of TCDD metabolized by B. megaterium is strongly dependent on the solvent used to add the TCDD to the culture, with ethyl acetate and dimethyl sulfoxide (DMSO) giving the best results. Apparently microbial degradation of TCDD is normally limited by poor cellular uptake of TCDD. The solvents facilitate cellular uptake and thereby increase the rate of degradation.

The amount of TCDD metabolized is also dependent on the culture medium used. The recommended medium for B. megaterium consists of 4% yeast extract and 1.6% soybean extract. Metabolism of uniformly  $^{14}\text{C}$  labelled TCDD was increased, however, when the concentration of soybean extract was reduced to 0.8% and 0.4%, especially when ethyl acetate was used as the solvent. After one week of incubation under these conditions, 58% of  $^{14}\text{C}$  activity was recovered as TCDD metabolites and only 29% as TCDD. We believe that the TCDD is incidentally metabolized by enzymes involved in the metabolism of certain compounds present in the soybean extract (co-metabolism), and that the dependence of the level of soybean extract is due to the way these enzymes are regulated. It is unlikely that the TCDD serves as a carbon or energy source.

We wish to emphasize that the increased rate of microbial degradation of TCDD we observed occurred in liquid media under laboratory conditions. However, we have found that small quantities of TCDD metabolites are formed in Michigan State University farm soil, and we have isolated two unidentified TCDD degrading bacteria from this soil. Thus it appears that microbial degradation of TCDD can occur in soil, and we hope that the information we have gained from working with broth cultures can be used to develop a technology to treat TCDD contaminated soil.



## APPENDIX III



### APPENDIX III

On August 25, 1983, three Italian officials from the Seveso Authority appeared before the Task Force to share their expertise in the area of clean up of dioxin contaminated soils. These officials, Dr. Umberto Fortunati, Mr. Alberto Piepoli, and Dr. Vito La Porta, traveled from Italy and toured several areas of the United States.

This appendix contains information about the accident and subsequent reclamation efforts at Seveso, Italy.

#### Governor's Remarks Dioxin Task Force Meeting August 25, 1983

Thank you very much, Judge Finch and our very distinguished guests from Italy.

We are indeed honored to have you with us and to have an opportunity to hear from you, and to learn from the experiences that you've had at Seveso. I want to express once again my continuing thanks and appreciation to the members of the Task Force.

Everybody in the State of Missouri and I, particularly, appreciate the time and effort that you have put in. When I asked you to take on this challenge, I knew it would be a difficult one, but I also was quite confident that the people of your caliber and your dedication, your background, your experience, we could have some good directions provided by you.

I again extend my very special thanks to our friends from Italy. We thank you for making the long journey here to share with us your knowledge and your expertise in the area of dioxin contamination and reclamation.

As you are probably aware, certainly Missouri, our own State, is currently faced with a serious dioxin problem. Here in Missouri, waste oil contaminated with dioxin was sprayed in many areas of the State. We feel this endangers the health of many Missourians.

The contaminated areas which are being confirmed every day include roads, parking lots, horse arenas, many other sites where Missourians may come into contact with the soil. The fact that many of these sites have gone undetected for up to twelve years have compounded the health risks and the possible existence, indeed the probable existence that additional sites lie waiting to be discovered by State and Federal officials.

The sad truth of the matter is that the State of Missouri is not alone in the United States in facing this problem. Michigan, New York, New Jersey, and many others also face severe dioxin problems, but the situation that I have described to you places Missouri at the forefront of the issue of controlled destruction, decontamination of dioxin, and the entire United States is waiting to see what directions we pursue in solving our problem.

In an effort to find a safe, effective and a permanent solution to Missouri's dioxin problem, I established this Task Force with whom you are going to be dealing today. This Task Force is composed of physicians, scientists, engineers, judicial leaders, concerned citizens, all of whom have agreed to devote their time and considerable talents to finding a solution.



The purpose of this Task Force is to evaluate what information exists about dioxin, its health effects, its behavior in the environment, and to recommend an appropriate disposal, a controlled method which safely and economically removes the threat of this deadly chemical from our environment.

I know that the valuable insights that you have gained in working with the dioxin problem in Seveso will be of great benefit to the Task Force. Some of the most important issues of concern to the Task Force and to me include, first, the environmental safety of the disposal methods used, the measures taken to protect the workers engaged in the process, the public and the environment during excavation or handling of contaminated material.

We recognize that differences exist in the way in which the contamination occurred, but we think that we have much to learn from your experience because of the similarity of the challenge we face.

Again, my sincere thanks, a very warm welcome to you on behalf of all the people of Missouri. We are honored that you would travel this distance to come to Missouri to join with us in working to solve a problem which is a very perplexing one for us as it has been for you.

We look forward to a mutually productive session, and we thank you so much for giving of your time and lending us your expertise. Thank you.

#### RECLAMATION OF THE TCDD-CONTAMINATED SEVESO AREA

Luigi Noe

Ufficio Speciale per Seveso

Seveso (Milano), Italy

On July 10, 1976 a complex mixture of chemical products escaped from the safety valve of a vessel employed in batch production of trichlorophenol (TCP). These chemicals were deposited on an area south of the chemical plant of ICMESA, in the Municipality of Meda, bordering the town of Seveso, approximately 12 miles north of Milano.

As a consequence of this event, a large number of small animals, namely, rabbits, chickens, and birds, died. After some weeks many children living in the same area developed chloracne.

After consultation with the Swiss chemists of the Zurich-based Givaudan Company, the technicians of the "Laboratorio Provinciale di Igiene e Profilassi" of Milano, at the request of the local Sanitary Authorities, determined that one of the main polluting compounds was dioxin (i.e., 2,3,7,8-tetrachlorodibenzo-p-dioxin). Using various sources and with the support of the Milan University (Institute of Pharmacology and Farmacognosy) as well as of the Institute of Health (I.S.S.), an analytical method using gas chromatography coupled with a mass-spectrometer was developed to determine the extent of the pollution. Evaluation of the polluted areas was undertaken within a relatively short time as a joint effort of all available personnel.

From the analytical results obtained, a map was drawn which indicated the three different "at risk" zones, designated A, B, and R (see maps in chapter by Pocchiari et al.).

The Lombardy Regional Institution which has, among its responsibilities, health control in the region, established an emergency plan which included the chemical monitoring of the environment and its inhabitants and the indemnification of local homeowners and industries which were affected by the contaminating cloud. The Italian Government intervened in this program by providing 40 billion lire (about 45 million dollars) in support and the Givaudan Company began paying damages.

The limits of the polluted areas were established mainly by taking into consideration the analytical sensitivity ( $0.01 \text{ ug}$  in  $1 \text{ kg}$  of soil) and the limited toxicological information available in the literature (only on animals). The Regional Law No. 2 of January 17, 1977 fixed at  $50 \text{ ug/m}^2$  the limit above which the area had to be barred to human inhabitants who, therefore, were compelled to leave their homes. Unfortunately, most were within the most polluted Zone A.

Police and army units were used to patrol the contaminated areas to prevent possible accidental contamination. In addition, a plastic fence, with iron net and poles, was built around the area.

In those areas where the pollution was below the  $50 \text{ ug/m}^2$  but above  $5 \text{ ug/m}^2$  school-age children and pregnant women were evacuated daily. Cultivation and animal breeding were prohibited as well as construction.

Finally, wherever the contamination was still detectable, but below the Zone B level ( $5 \text{ ug/m}^2$ ), in a very large area including the territories of six adjacent municipalities ( $1430 \text{ ha}$ ), it was decided to prohibit cultivation and animal breeding. Construction was also limited.

Possible intervention to decontaminate the territory was also considered. In phase two of the decontamination plan one of the most efficient methods to deal with the polluted material was to consider incinerating the area at  $1200^\circ\text{C}$  in a rotary kiln, similar to that used in cement production, assuming, of course, that alternative methods did not guarantee the destruction of the dioxin. The capacity of the incineration kiln was  $80\text{--}100 \text{ mt/day}$ . Alternative decontamination methods, which had been previously approved by the scientific consultative committees, needed to be tested first to demonstrate their practicality. Only after positive results were attained by any alternative decontamination program could the incineration plan be withdrawn.

The rotatory kiln project was soon abandoned, however, for many reasons: (1) the danger that some dioxin might escape from the incinerator stack; (2) the fear that such a large reclamation plant might remain after the reclamation process was terminated and be used for other polluted materials; (3) the time needed to construct and engineer a working pilot plant and the construction of an industrial-size plant would have required many years.

Many alternative decontamination methods were considered in the first months following the incident in order to devise other potentially simpler solutions. An advertisement, which appeared in the Italian newspapers, and a workshop organized by the Health Department of the Lombardy Region on September, 1976, stimulated a number of interesting ideas and projects, many of which were carefully evaluated by an "ad hoc" consultative committee. The Ufficio Speciale formed by the Lombardy Region specifically for the Seveso incident, acted as a screening unit for the several proposals received.

Between the years 1977-1980, several methods of soil reclamation that had been proposed by Italian and foreign researchers were evaluated. Unfortunately, none could successfully be adapted from the laboratory-bench scale to the field, due to the many engineering, construction, operating, and safety problems posed by the fact that hundreds of thousands of metric tons of soil or, more generally, of waste had to be treated. In addition, the dioxin concentration of the soil varied greatly from a few micrograms per kilogram of soil to picograms per kilograms of soil level in the same highly polluted area (Zone A).

The Special Office for Seveso is particularly interested in collecting information on these problems of degradation, since the results obtained in the clay and alluvial soil of Seveso of the reduction of TCDD concentration with time differed from that recorded in the US literature (Alvin L. Young et al. "Fate of TCDD in the Environment" October, 1976). In areas with a high concentration of TCDD the natural reduction was negligible, although based on percentage was appreciable in Zones B and R. This fact suggests that TCDD could be degraded by light and not by bacterial action.

Some alternative means of disposing waste from Seveso have also been evaluated: (1) incineration in the Atlantic Ocean; (2) direct dumping into the ocean; and (3) disposal in a salt pit. The international conventions of the use of the seas and, in the last case, the hostility of the population, made all these projects impracticable. Thus the most practical solution was to dispose of the polluted soil in basins, the peripheral parts of which were damproofed with a layer of Bentonite (a mixture of gravel and sand), overlaid with one sheet of plastic material (high density polyethylene), and finally capped with clean soil. This solution was favorable in that it removed toxic waste from the area and prevented any dispersion in the surrounding territory. The procedure is similar to the one used for radioactive waste, for which several natural and artificial barriers are used to ensure that no single radioactive element may come into contact with the environment. In the case of Seveso a variety of barriers were available:

1. The dioxin is bound to the clay, which is rather abundant in the soil of the polluted zones. In addition, dioxin is not water soluble.

2. In the disposal of the polluted soil resulting from the reclamation work, the most polluted is deposited in the central part of the basin while the less polluted is deposited around the core along the protective sheeting.

3. The plastic sheet (high-density polyethylene, 2.5 mm thick) is welded so as to constitute a unique blanket.

4. A 15-cm thick foundation built with sand and Bentonite (reinforced concrete), has the appropriate characteristics of impermeability and plasticity.

In addition to all these barriers, the deposit cap is protected by a layer of "Gunit" (concrete reinforced with an iron net) to prevent possible damage from the outside. The entire deposit is covered with a 1-m thick layer of soil. A well with a drainage pump allows the extraction of water which gathers at the bottom of the deposit during the filling phase. The water is extracted with a pump and then analyzed. The barriers are controlled by inspecting the inferior part of the basin through the well. Periodical checks of the deposit integrity are performed by personnel of the Sanitary Engineering Department of the Technical High School of Milano to ensure that the soil disposal system remains efficient.

The disposal project began during the summer in 1980 and, at the beginning, was of an experimental nature. Later, however, the National Committee authorized that it be extended to the polluted zone north of Via Vignazzola,

i.e., the most polluted area of the Zone A (approx. 10 ha). The entire subzone called A1, is now completely reclaimed. For the southern part of Via Vignazzola the Ufficio Speciale has suggested to the National committee that the same system be used. For areas with less contamination the possibility is being considered for further reducing the dioxin density by diluting with uncontaminated soil.

Careful analysis precedes the establishment of a pollution map before reclamation begins. Analysis is also needed to establish when the soil scarification can be stopped according to the limits fixed by the National Committee.

The Regional Government required Givaudan Company to evacuate the ICMESA Plant. All operations were stopped immediately after the accident. In addition, the company was ordered to begin, at their expense, a decontamination project of B department, the one from which the toxic cloud originated. This work could only begin after the removal of the "incriminated" equipment. A number of possible options existed to solve the problem of decontamination of the chemical equipment of department B:

1. Construction of a giant monolith (a concrete casting) to enclose both the equipment and the building containing department B.
2. Dismantle and (a) construct a small monolith to enclose the equipment only or (b) chemically reclaim the dismantled equipment.
3. Dismantle the equipment using the so-called "nuclear method," and successively remove the highly contaminated material properly contained and packaged.

From May to July, 1981, the Givaudan Company charged the CNEN (National Committee for Nuclear Energy, based in Rome, a public institution emanating from the Ministry of Industry) to engineer the dismantling of the equipment and to dispose of the equipment using the "nuclear method". In addition, contact was to be avoided between the workers and dismantled equipment. The equipment was to be encapsulated in specially designed containers and was to be disposed in a remote location. It has not as yet been decided where this highly contaminated material could be deposited. A number of suggestions are available: disposal in a salt mine, burial in a controlled and protected site, and burial in an abandoned pit in a mountain region to be selected depending on seismic and geographic characteristics.

All workers operating in the polluted areas were given physical examinations to ascertain their fitness. Workers were required to wear protective clothing (complete suit, mask with filter, and gloves) and were thoroughly informed about the risks involved in working in the area.

Workers changed into protective clothing in a "Filter Station" at the borderline of the fenced Zone A. Using the same selection criteria a control group was also chosen; this group was checked every 6 months. By comparing the results of both medical examinations, no differences were found between the workers who were exposed to the toxic compound and the control group. A report illustrating the medical control methodology was presented in June, 1981 at the Epidemiology Congress of Helsinki (Finland).

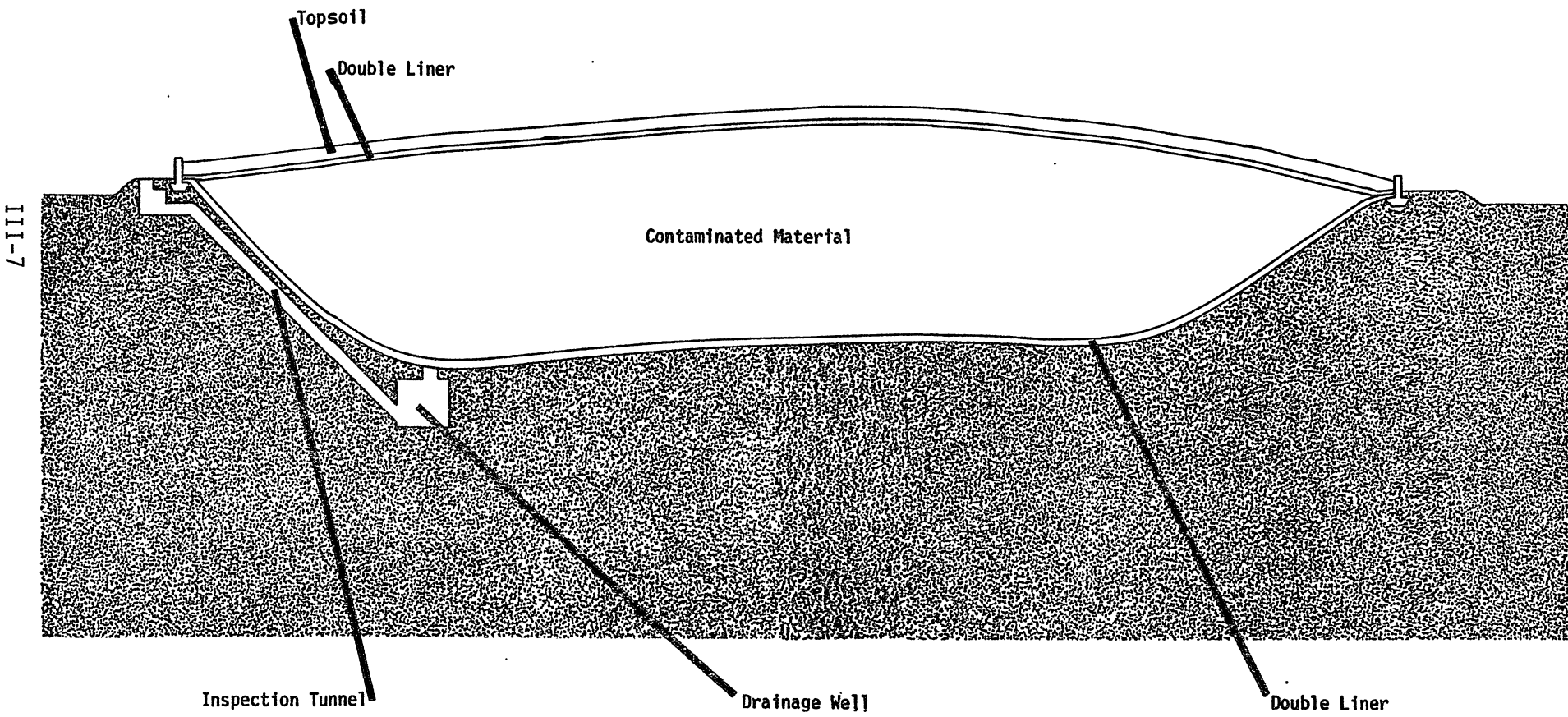
This summary emphasizes the technical aspects of the reclamation problem of the Seveso area, omitting other problems, such as political, sociological, epidemiological, which are beyond the scope presented here.

The search for a reclamation method has uncovered a number of organizational and operational problems, which the Italian Authorities are attempting to solve by a number of means. One is the establishment of a special authority under the responsibility of one Minister. Another is to elicit international cooperation in the regulatory and scientific fields. The

European Community has prepared (but has approved) guidelines, the so-called "Direttiva Seveso," by which the European national regulations can be incorporated into laws and enforced, to prevent possible future environmental pollution by industry.

It is the author's opinion, that the best safeguard for our future is the rise of an ecological conscience by the entire industrial community.

SEVESO, ITALY, BASIN



The following papers are available through the Department of Natural Resources, Waste Management Program.

METHODOLOGICAL PROBLEMS IN ASSESSING 2,3,7,8-TCDD ENVIRONMENTAL CONTAMINATION AT SEVESO

A. di Domenico, G. Viviano, and G. Zapponi

ANALYSIS OF THE TCDD-DISTRIBUTION AS A FUNCTION OF THE UNDERGROUND DEPTH FOR DATA TAKEN IN 1977 AND 1979 IN ZONE A AT SEVESO (ITALY)

G. Belli, G. Bressi, E. Calligarich, S. Cerlesi, S. P. Ratti

ENVIRONMENTAL PERSISTENCE OF 2,3,7,8-TCDD AT SEVESO

A. di Domenico, G. Viviano, and G. Zapponi

ENVIRONMENTAL IMPACT OF THE ACCIDENTAL RELEASE OF TETRACHLORODIBENZO-P-DIOXIN (TCDD) AT SEVESO (ITALY)

F. Pocchiari, A. di Domenico, V. Silano, and G. Zapponi

SEVESO - AN ENVIRONMENTAL ASSESSMENT

H. K. Wipf and J. Schmid

FOREWORD TO PAPERS I-VI: ACCIDENTAL RELEASE OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) AT SEVESO, ITALY

Francesco Pocchiari

## APPENDIX IV



Confirmed Dioxin Sites in Missouri October 31, 1983

Barry County

Denney Farm

Callaway County

Timberline Stables

Franklin County

Bull Moose Tube Company  
Quail Run Mobile Home Park

Greene County

Syntex Facility - Springfield

Jefferson County

Bubbling Springs Ranch  
Cashel Residence  
Minker Residence  
Romaine Creek  
Ruth Sullins Property  
Stout Residence  
Saddle and Spur Club  
Sandcut Road

Lawrence County

Bill Ray Farm  
Erwin Farm  
Rusha Farm  
Spring River  
Syntex Facility

Lincoln County

Shenandoah Stables

Newton County

Neosho Digester, Trench, Tank, Spill Area,  
and Wastewater School

Phelps County

Bliss Farm Road  
Wall Property and Piazza Road

St. Louis City

Hamill Transfer Company  
Jones Truck Line  
Overnite Transfer, Inc.

St. Louis County

Baxter Garden Center  
Community Christian Church  
Methodist Church  
Mid-America Arena  
Russell Bliss Oil Company (Frontenac)  
Sontag Road  
Southern Cross Lumber Company  
Times Beach

County Map

Site Summary

Location

Accessibility

History Summary

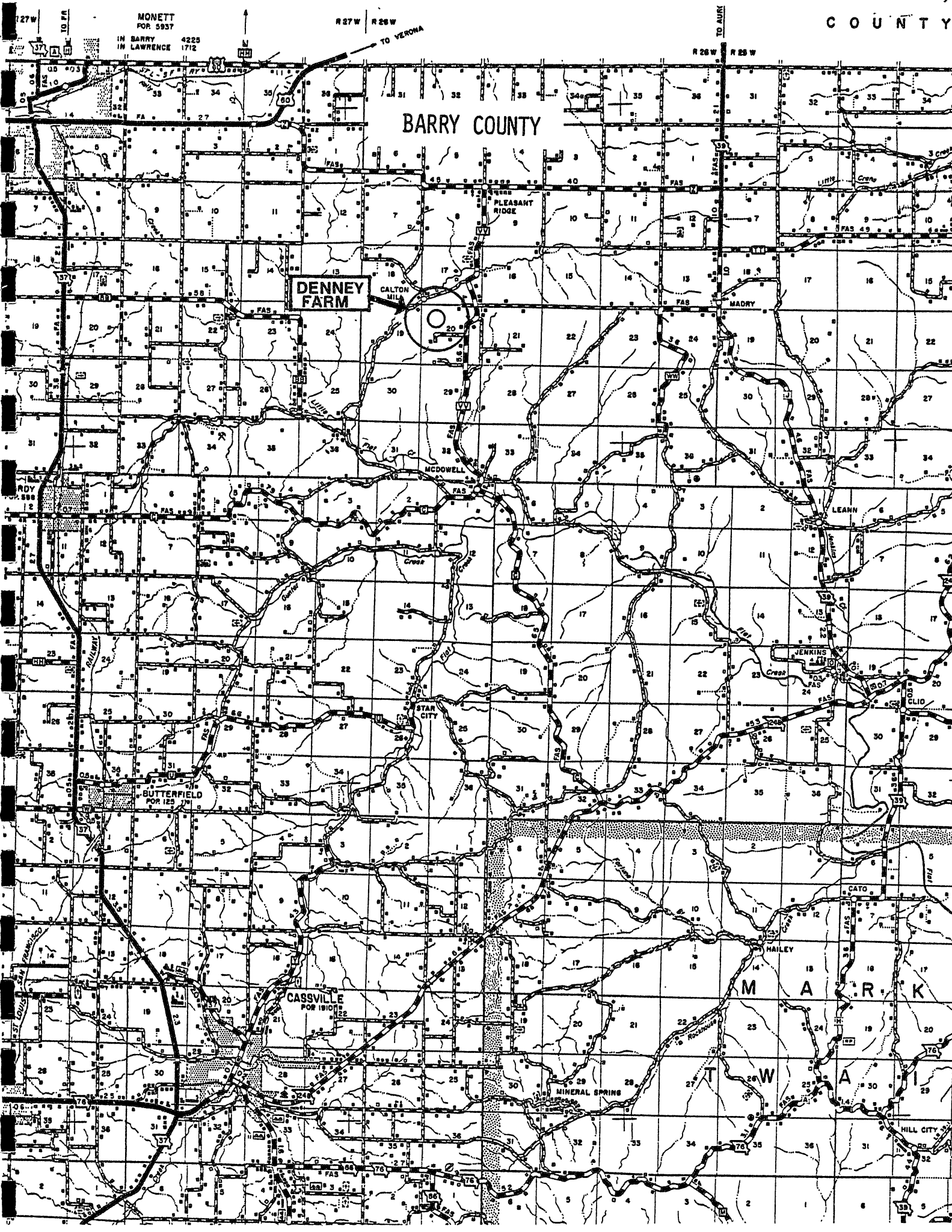
Site Description

Geologic and Soils Description

taken from Missouri Division of Geology and  
Land Survey Reports

Topographic Map

Site Map



127W 102E

MONETT  
FOR 5937

IN BARRY 4225  
IN LAWRENCE 1712

R27W R28W  
TO VERONA

R26W R25W  
TO AURORA

COUNTY

BARRY COUNTY

DENNEY FARM

CALTON MILL

PLEASANT RIDGE

MADRY

MCDOWELL

STAR CITY

BUTTERFIELD  
FOR 125

CASSVILLE  
FOR 1910

MINERAL SPRING

HAILEY

CATO

HILL CITY



## DENNEY FARM

### Location

Legal Description: SE 1/4, NW 1/4, NW 1/4, Section 20, T. 25 N., R. 26 W.,  
5th P.M.  
McDowell Quadrangle  
Barry County  
Latitude: 36° 51' 55"  
Longitude: 93° 48' 25"

### Accessibility

The Denney Farm is on the west side of County Road VV, between Pleasant Ridge to the north and McDowell to the south. The contamination area is 3/4 mile west of County Road VV, accessible by a dirt and gravel lane.

### History Summary

In 1979, the Region VII EPA office in Kansas City received an anonymous communication about previous waste handling and disposal procedures of NEPACCO. An investigation at the Denney farm found a depression in the gravel about 10 by 53 feet, next to a mound of excavated soil. It was believed that between thirty and one hundred fifty 55-gallon drums were buried at that location in June, 1971.

A plan of action was implemented in April, 1980, which began by erecting a security fence around the site, and collecting bore hole soil samples around the perimeter of the disposal pit. Then the drums were unearthed, of which 13 were found, and the contents of each was sampled. TCDD concentrations up to 319 ppm were found in the drum contents, along with 2,4,5-trichlorophenol (TCP), ethylene glycol, tetrochlorobenzene, and alkylbenzene. Others were suspected. Soil samples showed that contamination was not migrating laterally from the site.

On-site and off-site groundwater sampling was done in several wells. All samples were negative for phenolics, TCP and TCDD. Samples of sediment and fish were taken from surface waters surrounding the site, and no contamination was detected. Syntex Agribusiness, Inc. took over responsibility of the site, and developed and funded remedial action. The action consisted of excavating the drums and contaminated soil and storing securely on-site, while options for destroying the contaminants are studied. The existing condition of the site is contained in the site description.

### Site Description

The farm consists of 160 acres. The disposal site is situated on a wooded ridge top northwest of the farmhouse.

The site presently consists of three contamination storage structures. The temporary on-site drum storage area (TOSDSA) contains the approximately 90 drums partially filled with liquids, sludges, or filter material which were uncovered, sampled, overpacked in new drums, and removed from the trench. The TOSDSA also contains 35 drums filled with visibly contaminated soil. Other soil in the trench was excavated and placed in one of two microbiological degradation basins (MDB). All of the structures are constructed of reinforced concrete with drainage collection systems. Monuments at the four corners mark the boundary of the trench area, which is covered with a synthetic liner, topsoil and sod. The area is lighted and monitored for intruders.

### Geologic and Soils Description

The area is underlain by Mississippian age bedrock, specifically the Reeds Spring Formation, a gray to blue-gray limestone with alternating bands of chert. This limestone is extensively fractured and relatively soluble, which has allowed a classical karst topography to develop. Above bedrock is a residual float rock of chert and cherty limestone probably from 10 to 30 feet thick. Next is residual red silty clay and chert fragments. The thickness of this layer directly under the site varies from 11 to 37 feet. The site is capped with 2 to 3 feet of loess, which is a low plasticity silt.

Permeability in the area could range from  $10^{-3}$  cm/sec to  $10^{-7}$  cm/sec. This could have placed the leachate boundary after nine years at 1 foot below the trench ( $10^{-7}$  cm/sec.), or it could have reached bedrock ( $10^{-3}$  cm/sec.). Lateral movement of fluid leaving the trench was unlikely, and this was confirmed by borings.

27 W. R 26 W.

427

7257 IV NE  
(VERONA)

428

PLEASANT RIDGE 1.5 MI.

47'30"

430

710 000 FEET

PLEASANT RIDGE

MC DOWELL, MO.

SE/4 MONETT 15' QUADRANGLE

N3645-W9345/7.5

MC DOWELL

McDowell

BM  
1161

BM 1195

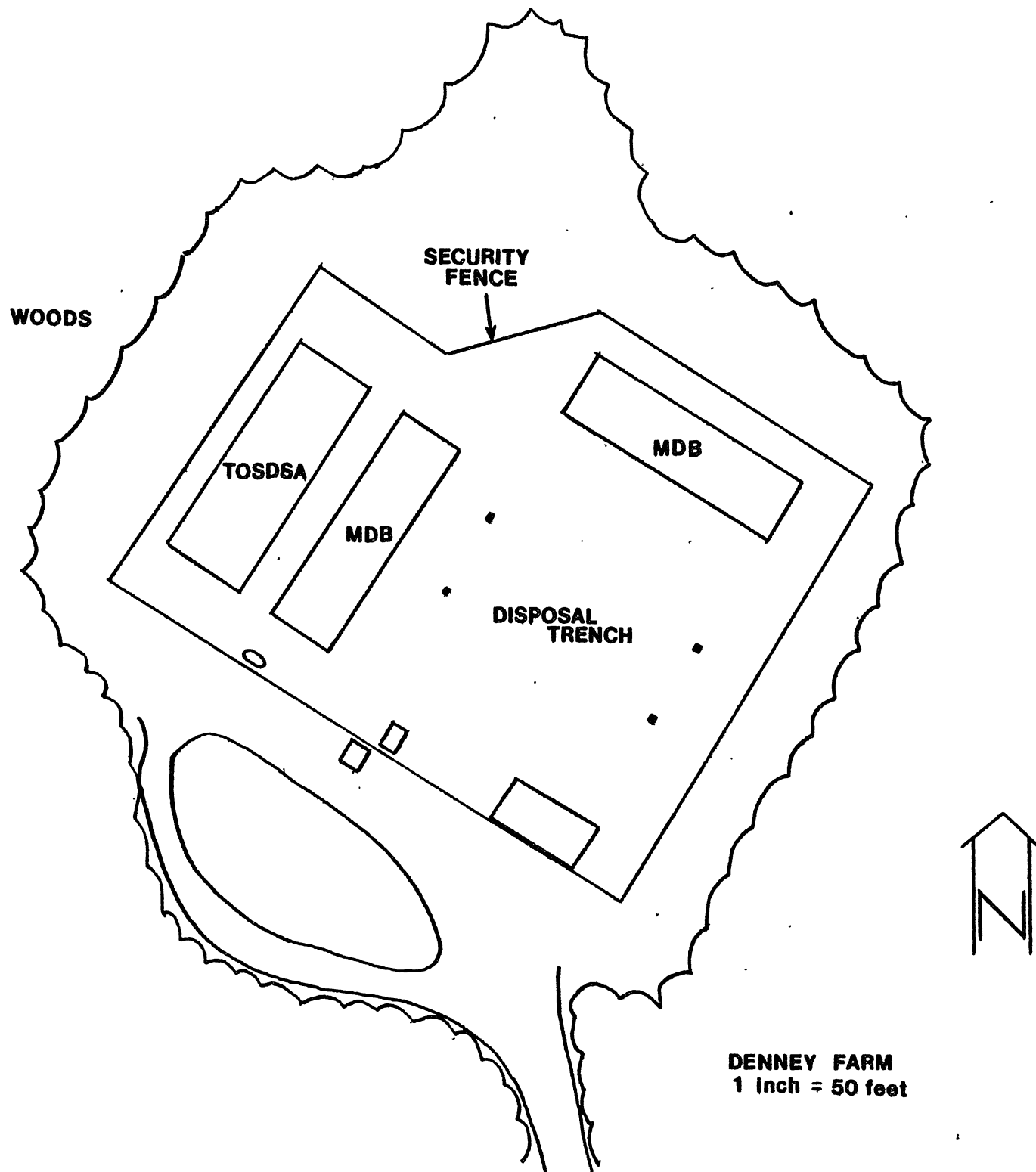
Creek

Canyon

Ford

plat

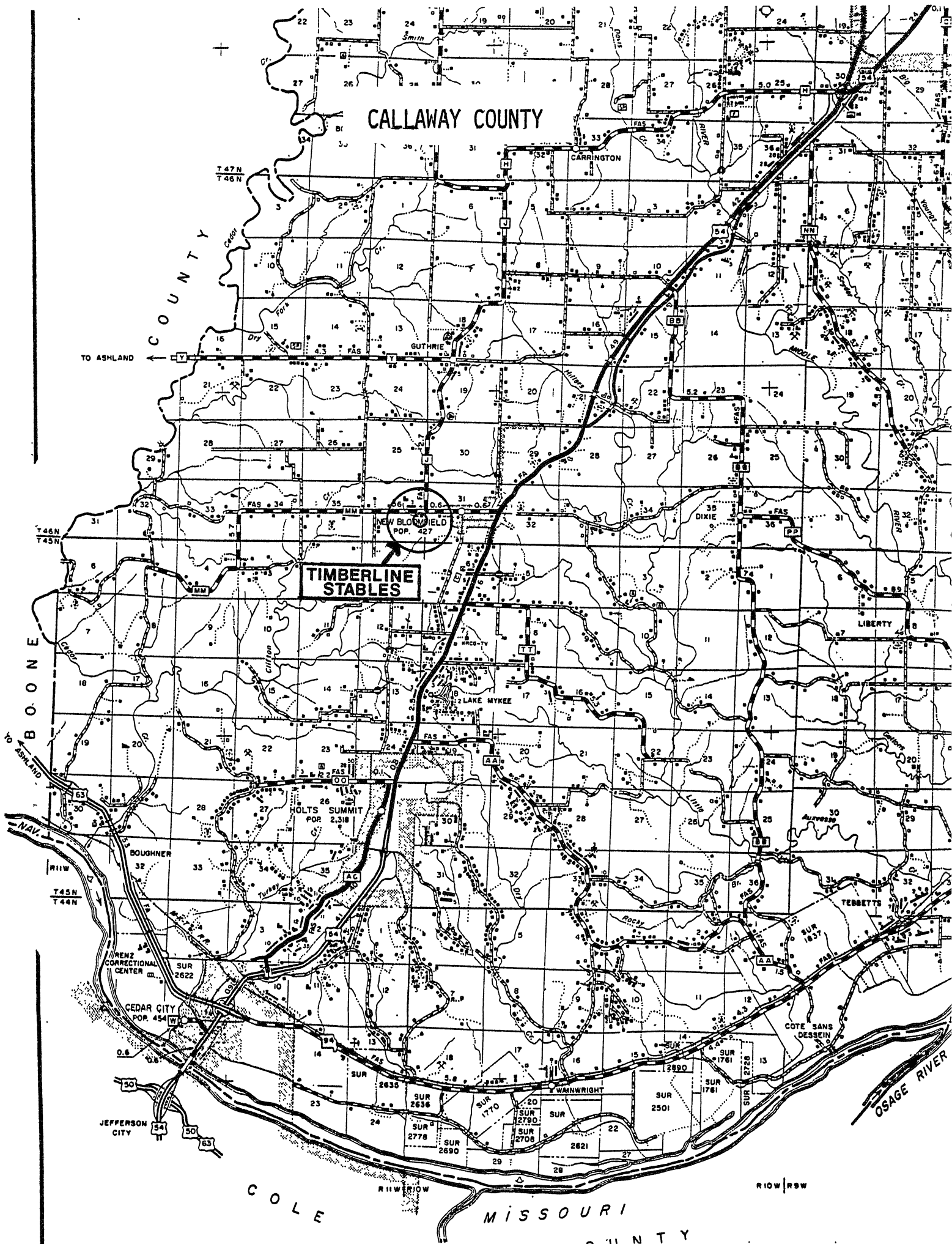
Camp



**DENNEY FARM**  
**1 inch = 50 feet**



# CALLAWAY COUNTY



## TIMBERLINE STABLES

### Location

Legal Description: NE 1/4, NE 1/4, SE 1/4, Sec. 36,  
T. 46 N., R. 11 W., 5th P.M.  
New Bloomfield Quadrangle  
Callaway County

Address: New Bloomfield, Missouri 65063

### Accessibility

The stables can be reached by taking Missouri Highway 54 to New Bloomfield, 18 miles south of Interstate 70. From New Bloomfield, take County Road J 1.2 miles west to its junction with MM. The arena and stables sit immediately to the southwest of the junction.

### History Summary

The arena was sprayed by Bliss Oil Co. in 1971. Following the death of 12 horses and two children becoming ill, the arena was excavated. Approximately 12 inches of soil from the arena was excavated in 1972 and taken to the Jefferson City landfill. Sampling revealed that 2,3,7,8-TCDD contamination still exists in the arena. EPA has issued a unilateral order requiring closure of the arena.

### Site Description (See Map)

The site consists of a large barn containing the arena, snack bar and stables. There are also additional stables and a trailer on the property. The arena is 78 by 138 feet and is contaminated at the following levels:

#### Composite from middle of arena:

0-6"	1.7 ppb
6-12"	7.6
12-18"	3.8
18-24"	4.4
24-30"	0.7

#### Composite from perimeter of arena:

0-6"	8.0 ppb
6-12"	29.5
12-18"	41.5
18-24"	8.1
24-30"	2.8

Dust samples were also positive. Sample from over the snack bar had 53 ppb and from the arena walls had 24 ppb. Second round sampling was done in the stable portion of the building in the two dirt horse walkways. One walkway sample was undetectable at less than 1 ppb and the other contained 1.2 ppb and 22.3 ppb in two samples. Of three samples taken from a manure pile, two were negative, and one was positive at less than 1 ppb. One background sample from the property contained 3.8 ppb.

### Geologic and Soils Description

Timberline Stables sits near the watershed divide of two tributaries of Clifton Creek, on slightly sloped terrain. Drainage from the site would be to the south into a well developed wet weather stream channel. Pennsylvania sandstone and shale outcrop about 1 mile downstream of the site. There is no evidence that the stream loses water to the subsurface.

Well logs in the area show about 75 feet of unconsolidated materials, mostly glacial till and bedrock residuum over Burlington-Keokuk limestone at the site. The glacial till at the surface is clay rich, preventing the transport of surface sediments into the subsurface via downward water movement.

4289000m.N.

G U T H R I E

4288

4287

4286

T. 46 N.

T. 45 N.

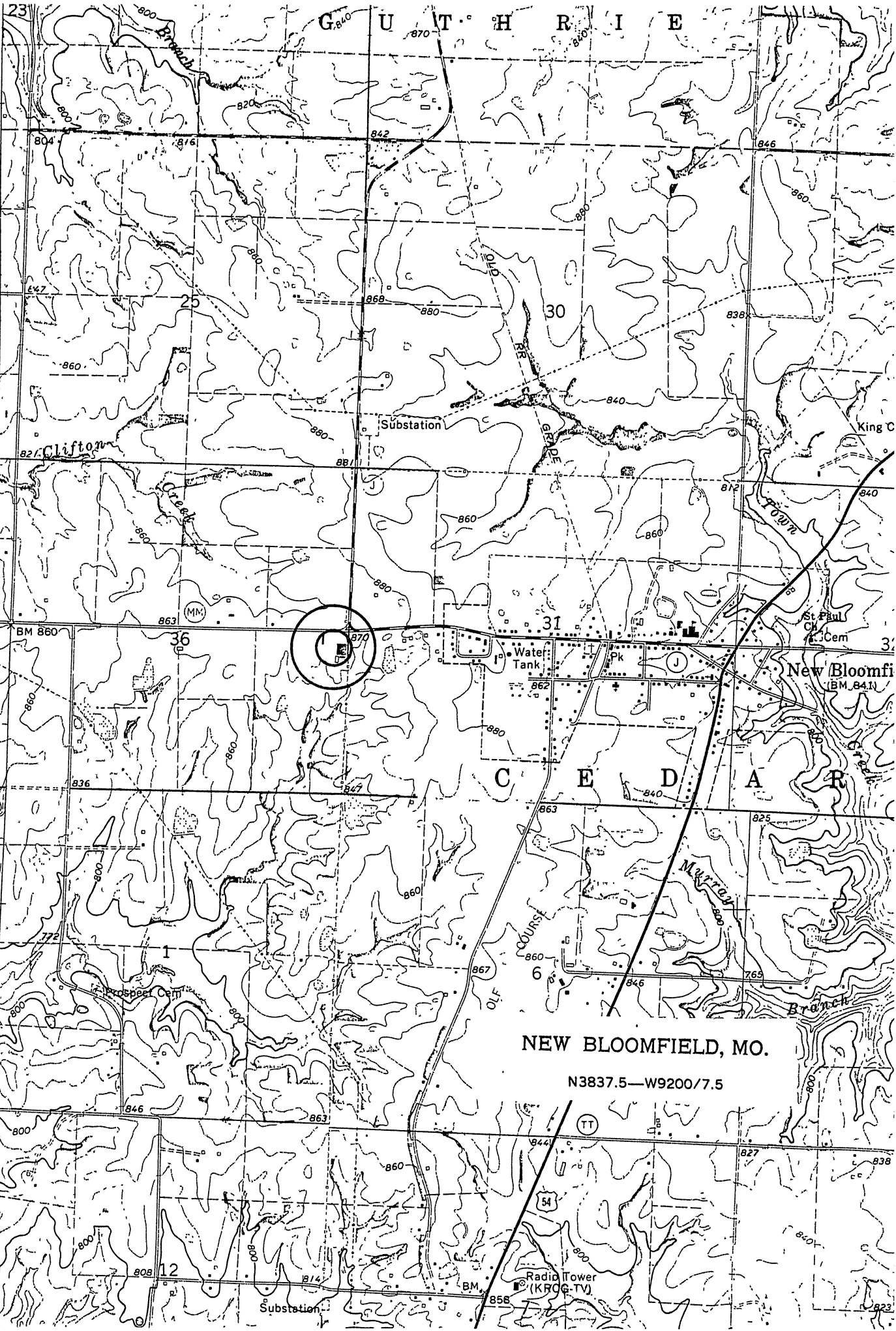
4285

42'30"

4284

4283

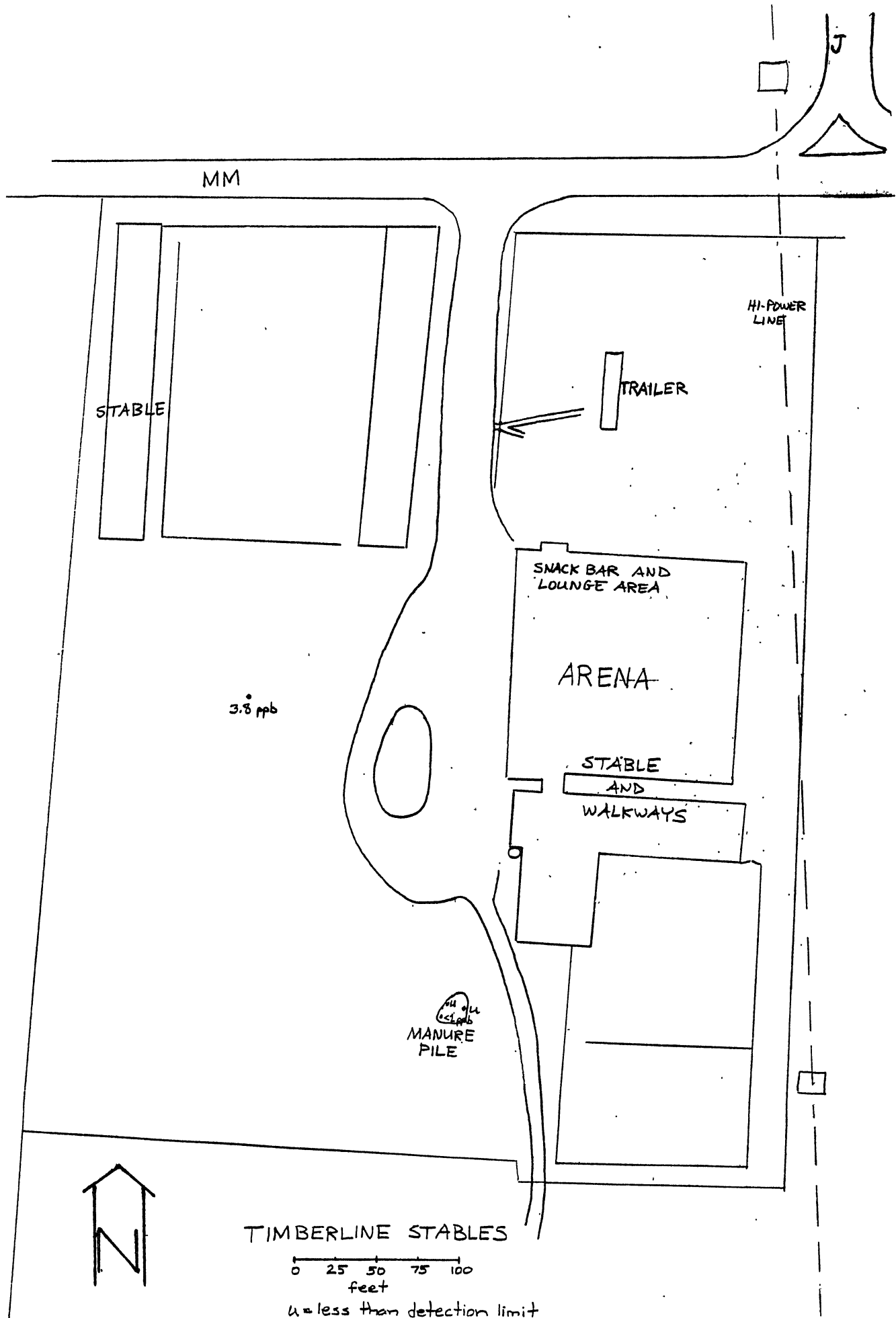
NW

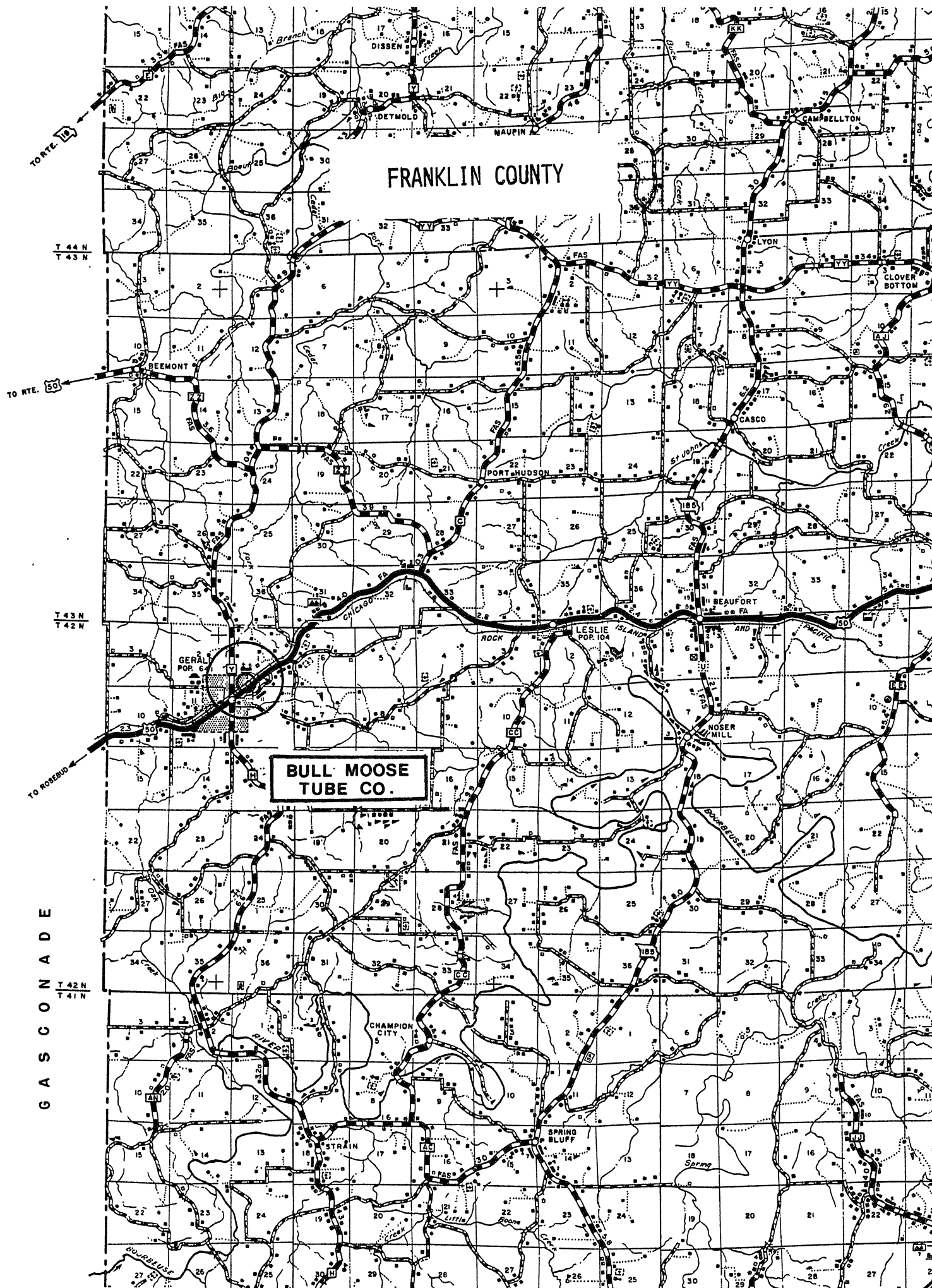


NEW BLOOMFIELD, MO.

N3837.5—W9200/7.5

Radio Tower  
(KROG-TV)





## BULL MOOSE TUBE COMPANY

### Location

Legal Description: SE 1/4, SW 1/4, SW 1/4, Sec. 1,  
T. 42 N., R. 4 W., 5th P.M.  
Gerald Quadrangle  
Franklin County

Address: Gerald, Missouri 83037

### Accessibility

The site sits just north of U.S. Highway 50, northeast of Gerald, within the city limits. Access to the site is only by taking County Road Y north out of Gerald and turning right onto the plant entrance road.

### History Summary

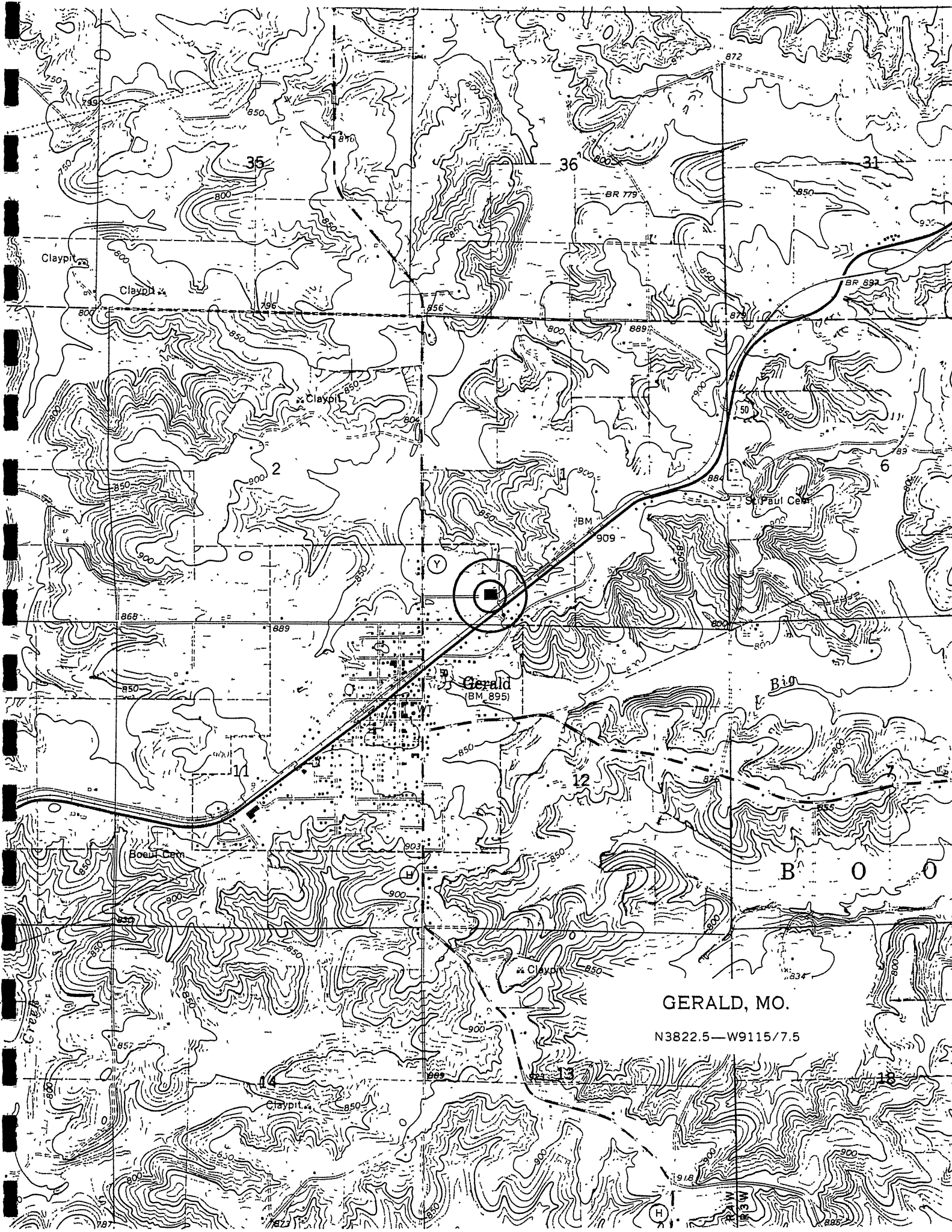
The plant roads were oiled by oil haulers several times during the 1970's. According to company records, Bliss Waste Oil Service oiled the site in 1973 and 1977. Missouri Department of Natural Resources investigation led to sampling in spring, 1983, which yielded positive results.

### Site Description (see map)

The site consists of the large factory building, an office building, parking and storage lots, and wastewater treatment lagoons. The reported oiled areas were adjacent to the west and north sides of the factory building. The entire property as well as drainage paths away from the site were sampled. Positive 2,3,7,8-TCDD results were found only north and slightly northwest of the factory in the oiled area. Levels range from less than 1 ppb to 29 ppb. All samples taken at depths greater than 12 inches were negative except for one at less than 1 ppb. The contaminated area has a gravel surface. The nearest residence is across Highway 50 from the site.

### Geologic and Soils Description

Not available.





BULL MOOSE  
TUBE CO.

0 75 150



EVAPORATION  
LAGOON

SEPARATION  
LAGOON

FILL  
AREA

OILED AREA

TRAILER  
AND  
TUBE  
STORAGE

FACTORY

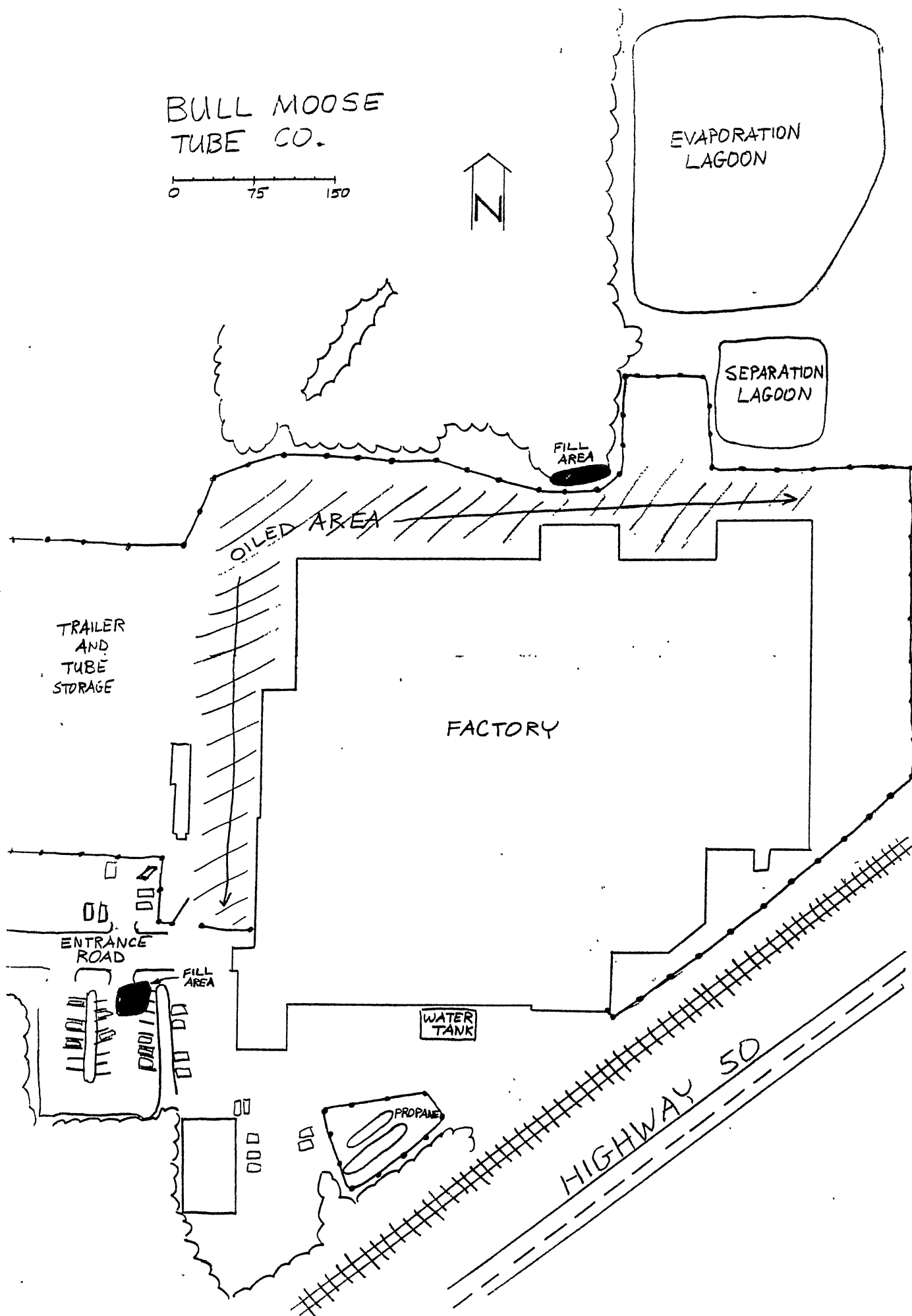
ENTRANCE  
ROAD

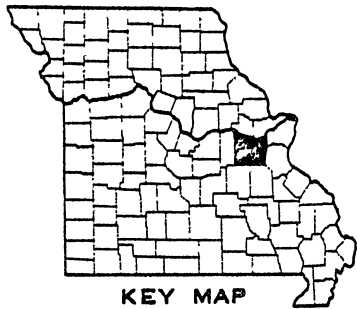
FILL  
AREA

WATER  
TANK

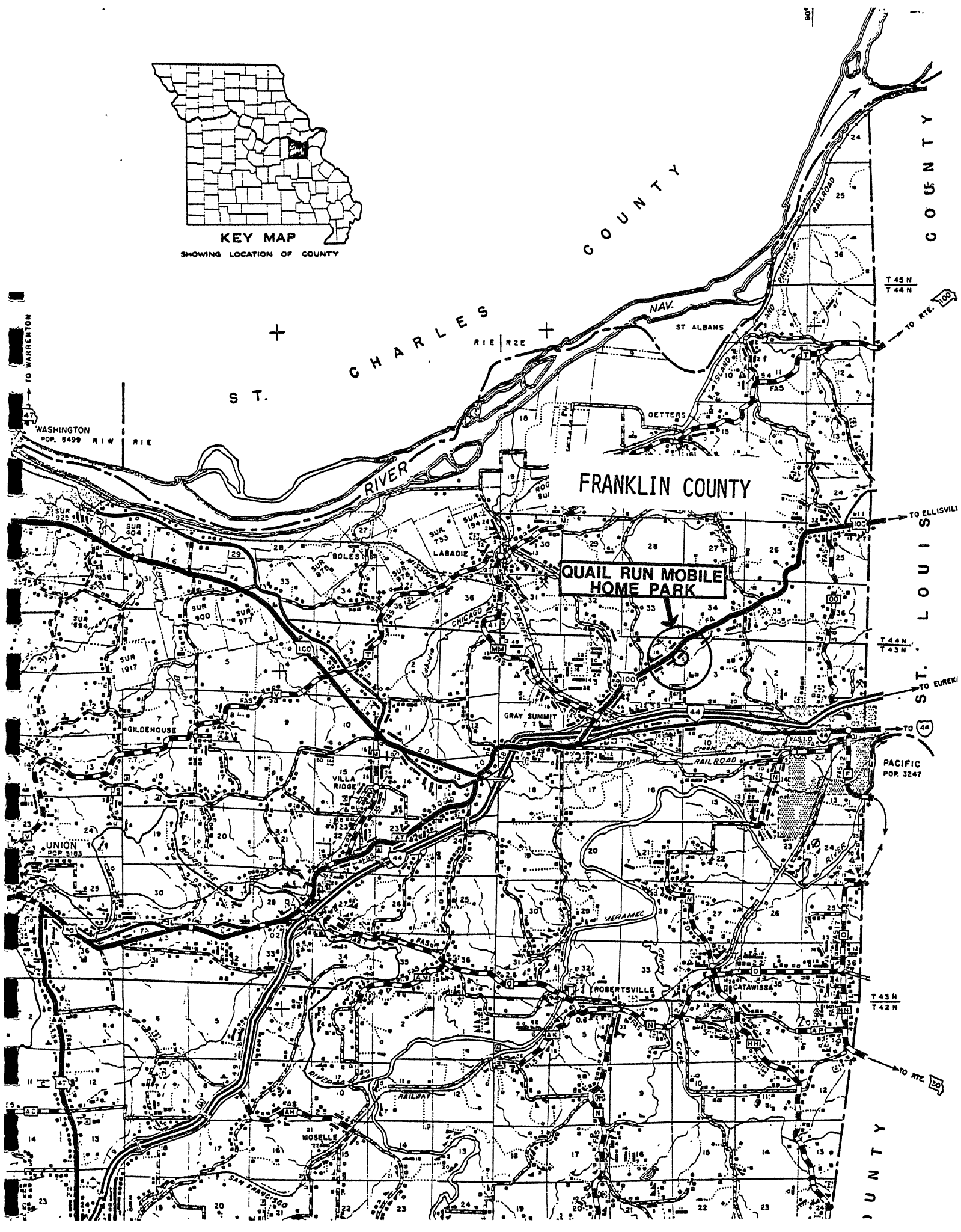
PROPANE

HIGHWAY 50





KEY MAP  
SHOWING LOCATION OF COUNTY



## QUAIL RUN MOBILE HOME PARK

### Location

Legal Description: NW 1/4, Sec. 4,  
T. 43 N., R. 2 E., 5th P.M.  
Labadie Quadrangle  
Franklin County

Address: Gray Summit, Missouri

### Accessibility

The mobile home park lies on the east side of Missouri Highway 100, about 1.5 miles northwest of Gray Summit, in northeast Franklin County.

### History Summary

The main road through the mobile home park was sprayed with contaminated waste oil in the early 1970's. The contaminated oil apparently was diluted very little due to the high 2,3,7,8-TCDD levels found at the site. The site was sampled a second time after screening sampling revealing fairly widespread contamination. The residents have been temporarily relocated and remedial actions are being studied by EPA.

### Site Description

The trailer park consists of 38 trailers with a 1,180 foot road which ends about 150 feet in front of a sewage treatment lagoon. There were at least 100 residents prior to relocation. There are private residences on both sides of the entrance to the park.

The entrance to the park is at the top of a ridge and the site slopes toward Little Fox Creek. The first 600 feet of the road slopes only 1% to 2% and drains to the north. In this part of the road, 2,3,7,8-TCDD analyses in the center of the road range from 560 to 1,100 ppb in the first foot, 35 to 205 ppb from one to two feet, 84 to 160 ppb from two to three feet, 24 to 231 ppb from three to four feet, 0.1 to 9.7 ppb from four to five feet, and 0.1 to 7.8 ppb from five to six feet. On the north side of the road, levels were 33 to 150 ppb from zero to six inches, and on the south side from 7.3 to 32 ppb.

The rest of the road, about 580 feet, slopes 5% to 7% and drains to the south. Analyses in the center range from 8.9 to 82 ppb in the first foot, 2.6 to 53 ppb from one to two feet, 2.6 to 25 ppb from two to three feet, 0.9 to 72 ppb from three to four feet, 0.1 to 3.4 ppb from four to five feet, and 0.1 to 34 ppb from five to six feet. On the north side of the road, results were 1.8 to 20 ppb in the top six inches, and on the south side from 16 to 87 ppb.

Sampling in trailer yards resulted in 0.9 to 11.7 ppb in the top six inches on the north side of the road in the 12 trailer yards closest to the entrance. Yards south of the road had from 0.3 to 0.8 ppb.

The area between the road and the lagoon was reportedly where graded road material was deposited. Concentrations found in this area were 0.2 to 25 ppb in the top six inches, 0.16 to 4.5 ppb from six to twelve inches, and 0.09 to 3.5 ppb from one to two feet, and 0.1 to 3.8 ppb from one and one-half to three feet.

One sample out of seven taken was positive in Little Fox Creek sediment at 1.6 ppb.

Dust samples from 18 trailers sampled ranged from 1.0 to 5.2 ppb.

Three samples south of the highway were positive at 6.8, 3.1, and 1.4 ppb. Also a reported fill area at the house south of the park entrance had 2.7 ppb in a 0 to 36 inch composite sample.

The shoulder of Highway 100 opposite from the park entrance contains dioxin concentrations between 1 and 3.8 ppb in the upper two inches of soil.

#### Geologic and Soils Description

Most of the Quail Run Mobile Home Park is underlain by modified loess and Pennsylvanian cherty clay residuum which is underlain by the Joachim dolomite. The loess is a silty clay to clay deposit which is about 10-12 feet thick in the Park area. The residual materials consist of an abundance of chert fragments in a clay matrix. Although the chert makes up 30% to 40% of the residuum, the matrix of clay is uniform and forms a relatively impermeable deposit. In portions of the surrounding area, a surface covering of the modified loess is underlain by colluvium which rests on the Joachim dolomite. The valley is alluvium material underlain by Joachim dolomite. The Joachim is relatively impermeable and is not a water-bearing formation. It is underlain by St. Peter sandstone which is a major aquifer for water supplies in the area. The Pennsylvanian residuum retards water movement and creates perched water tables in the loess layer.

LABADIE, MO.

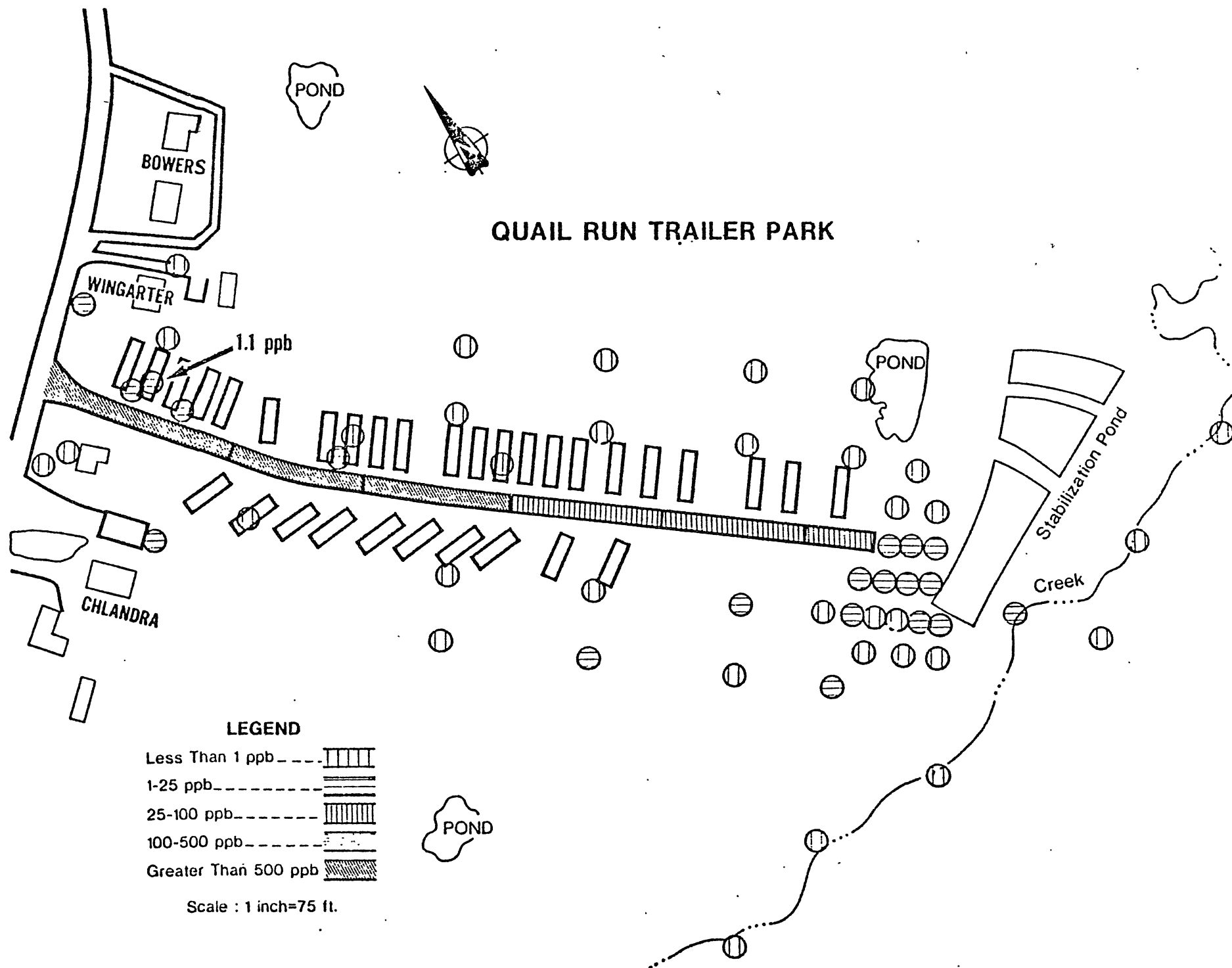
SE/4 AUGUSTA 15' QUADRANGLE  
N3830—W9045/7.5

GRAY SUMMIT, MO.

NE/4 ST. CLAIR 15' QUADRANGLE  
N3822.5—W9045/7.5

Gray Summit

MISSOURI BOTANICAL GARDEN





## SYNTEX FACILITY-SPRINGFIELD

### Location

Legal Description: NE 1/4, SW 1/4, Sec. 27,  
T. 29 N., R. 22 W., 5th P.M.  
Springfield Quadrangle  
Green County

Address: Bennett Street  
Springfield, Missouri

### Accessibility

The site sits on the south side of Bennett Street, which runs east-west, just northeast of the intersection of U.S. Highway 60 and Missouri Highway 88.

### History Summary

The facility was operated in the 1960's by Hoffman-Taft, during which pilot scale tests on 2,4,5-T production took place. NEPACCO also used the plant. During the 1970's, liquid wastes were transferred from an inactive lagoon at the Verona Facility to the Springfield lagoon. In 1980, EPA sampled the liquid and sludge in the Springfield lagoon and found no 2,3,7,8-TCDD at a detection limit of 8 ppb. Following closure of the lagoon in 1981, the lagoon sludge was sampled and found positive at levels from 1 to 8 ppb. Upon these results, other areas of the pilot plant were sampled by Syntex and found to contain low levels of contamination.

### Site Description (See Map)

The Facility covers several acres between Jordan Creek and the Missouri Pacific Railroad. The lagoon sits near the south end of the site and covers approximately .12 acres. An area south of the lagoon was previously filled in. A summary of sampling is as follows:

1. Lagoon sludge - 4 composites range from 1 to 8 ppb.
2. Lagoon water - 1 grab sample nondetectable at 3 ppt.
3. Pretreatment system
  - a. sludge in settling chamber - 1 grab sample 1.5 ppb
  - b. supernatant - three 24-hour composite water samples  
nondetectable at 2 to 3 ppt.



4. Lift station to pretreatment system deposits - 0.3 ppb.
5. Deposits from sewers leading from pilot plant to other portions of the waste treatment system - .099 ppb to 5.9 ppb.
6. Samples taken from the old lagoon area that was filled in have not been analyzed.

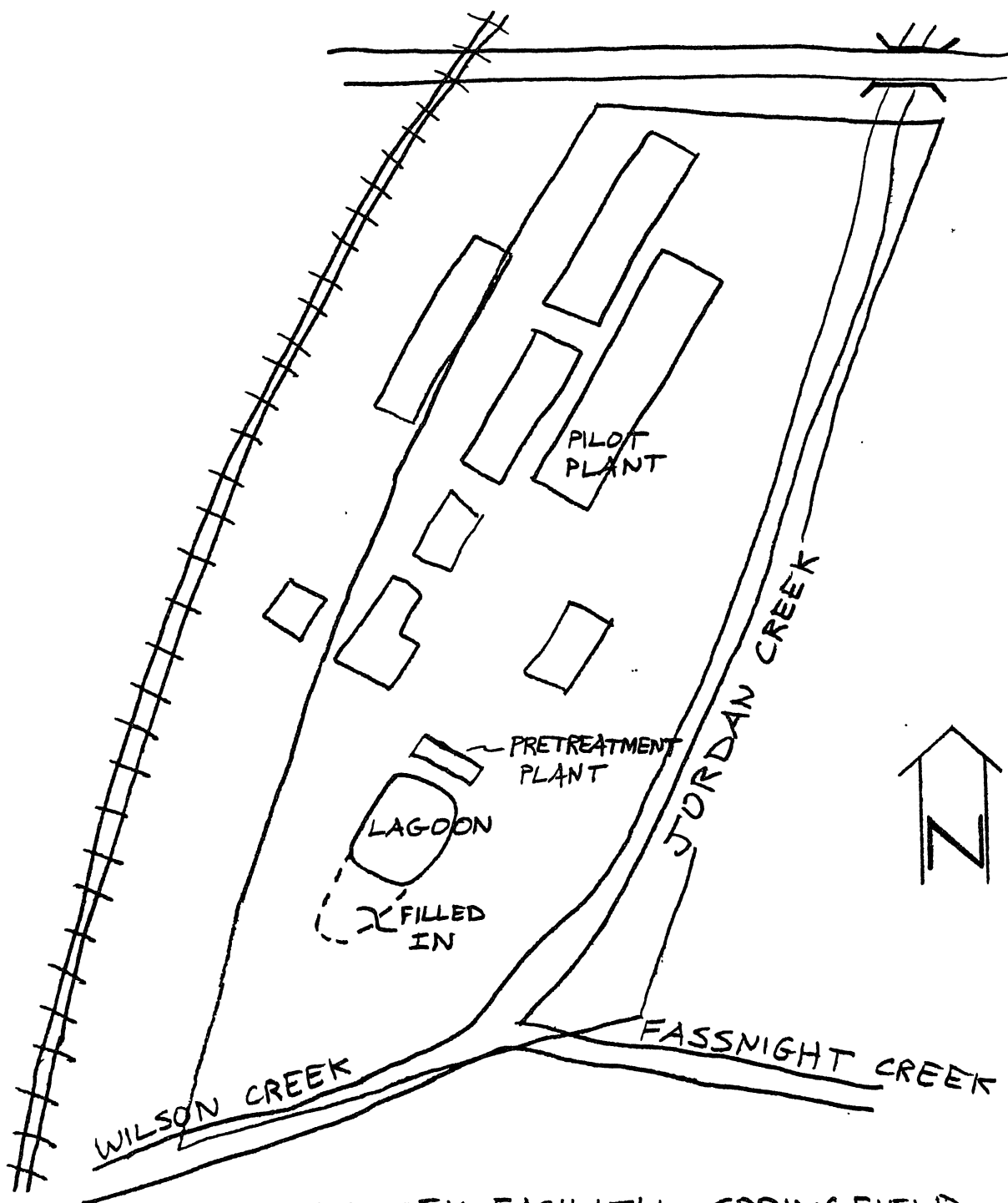
Apparently, dioxin containing material is lodged in the old sewers and is continually sloughed off as contamination was found in sewer lines built around 1981-82. Syntex is planning to cap the sewer lines and bypass them with new pipe. Also, monitoring wells were installed around the lagoon. The wells revealed that the lagoon contaminants were leaking into the subsurface. Remedial action began immediately.

#### Geologic and Soils Description

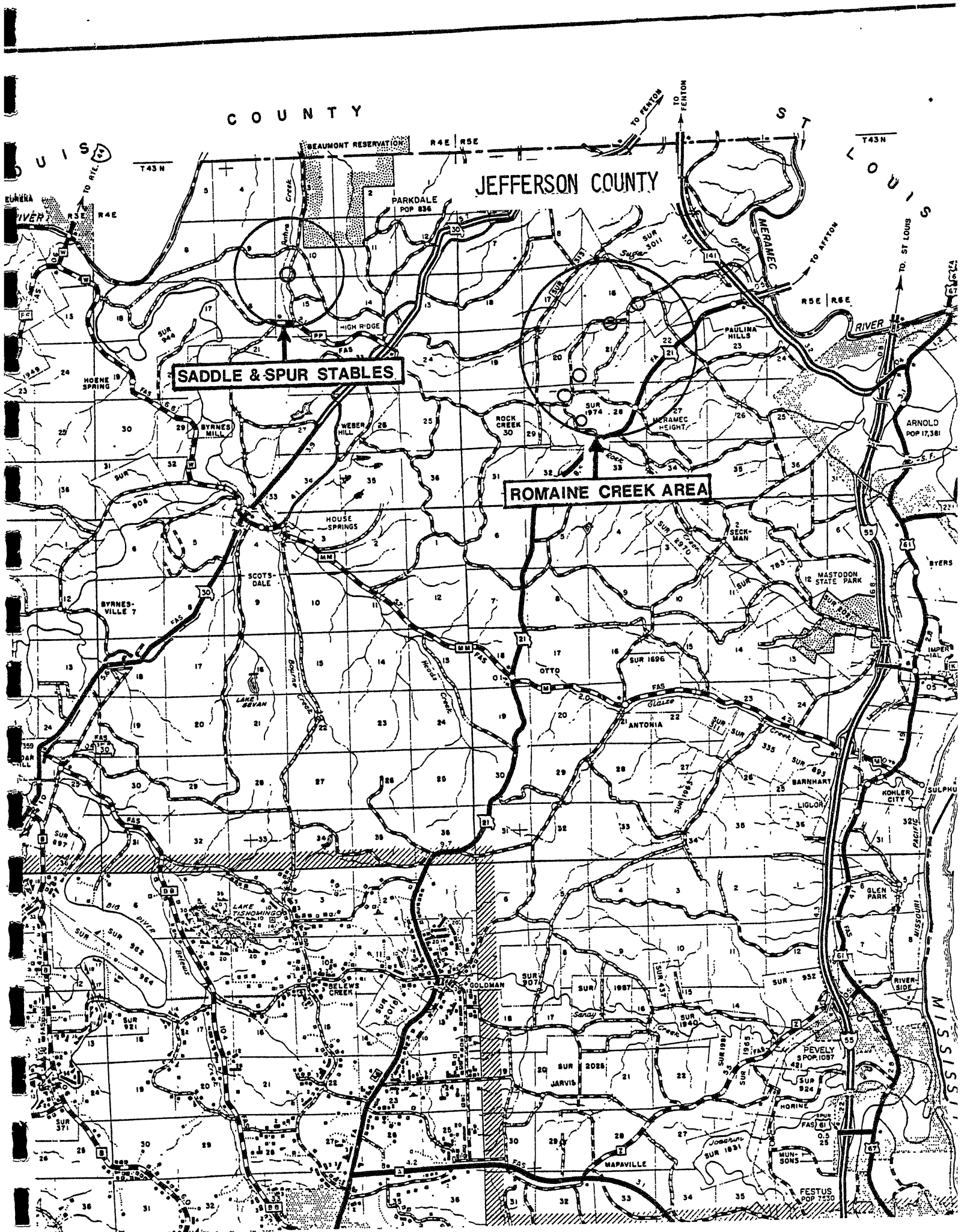
The site is on the floodplain at the convergence of Jordan and Fassnight Creek. The streamamystem is gaining or at least maintains stable flow until downstream of Highway 60. Soils in the floodplain are silt loam to silty clay, with permeabilities from  $10^{-6}$  to  $10^{-7}$  cm/sec. The thickness would be around 6 to 8 feet. Permeabilities would increase at depths greater than about 8 feet due to increasing gravel content. Contaminatant movement via particles out of the lagoon is unlikely; however, if it were to occur, the movement would be into Wilson Creek.



SPRINGFIELD, MO.  
N3707.5—W9315/7.5



SYNTEX FACILITY - SPRINGFIELD



COUNTY

JEFFERSON COUNTY

SADDLE & SPUR STABLES

ROMAINE CREEK AREA

BEAUMONT RESERVATION

PARKDALE  
POP 836

HIGH RIDGE

PAULLINA HILLS

ARNOLD  
POP 17,381

HOUSE SPRINGS

SCOTTS DALE

BYRNESVILLE 7

LAKE SEVAN

ANTONIA

BARNHART

KOHLER CITY

SULPHUR CITY

LAKE TASHKINGO

BELEWS CREEK

GOLDMAN

JARVIS

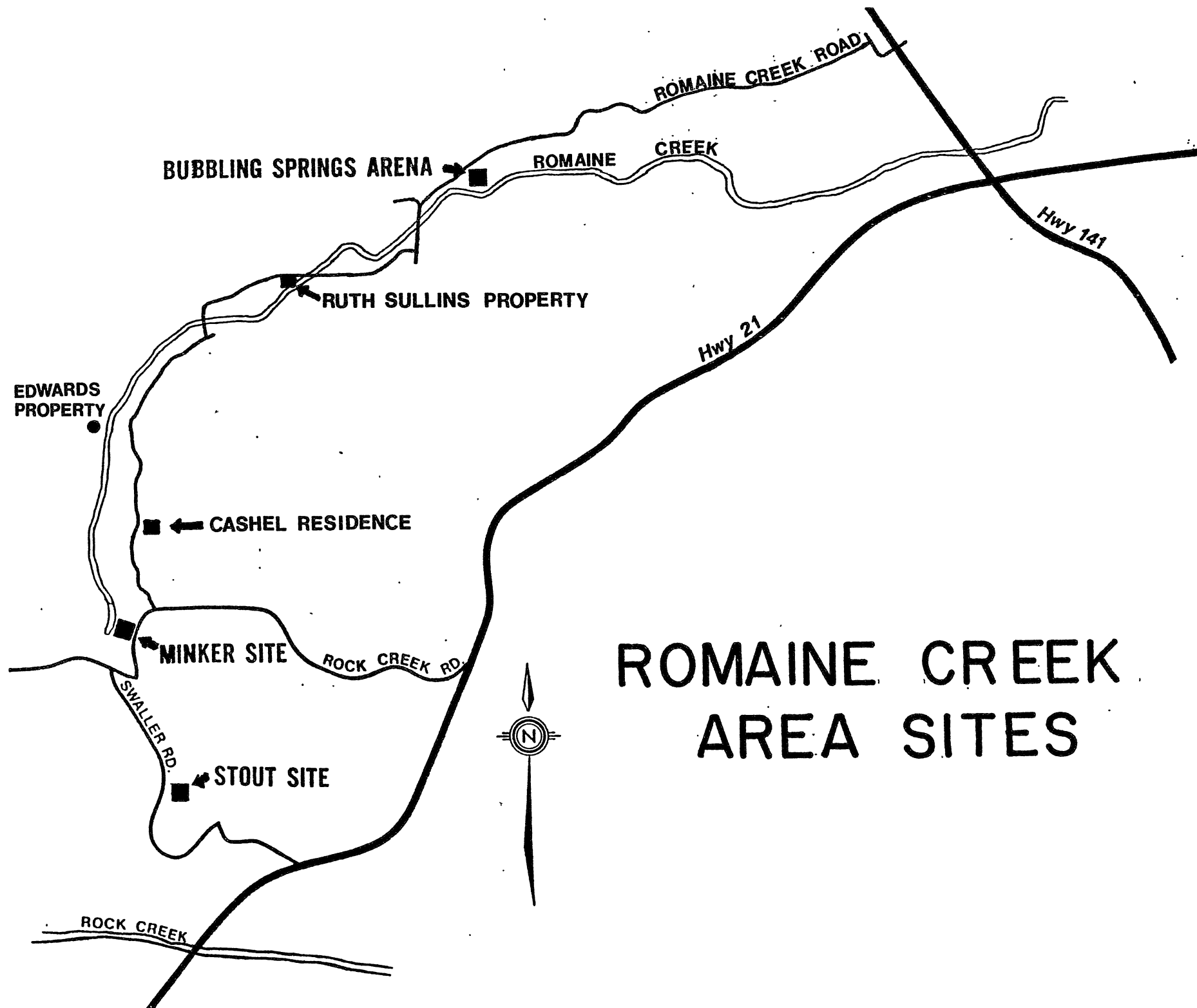
MAPOVILLE

FEVELY  
POP 1087

HORINE

MUNSON

FESTUS  
POP 7530



## BUBBLING SPRINGS RANCH

### Location

Legal Description: Part of Survey No. 3011  
By extrapolation: SE 1/4, Section 16, and SW 1/4,  
Section 15, T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County  
Latitude: 38° 27' 50"  
Longitude: 90° 27' 20"

Address: 1300 Romaine Creek Road  
Maxville, Missouri

### Accessibilty

Bubbling Springs Ranch is located 1.5 miles west from Missouri State Highway 141 on Romaine Creek Road. Romaine Creek Road is low type bituminous.

### History Summary

In June 1971, the arena at Bubbling Springs Ranch was sprayed with contaminated waste oil. It is believed that the contaminated still bottoms were diluted with oil for this spraying. In March 1973, after several incidents of horse illnesses and deaths, about 850 cubic yards of soil was excavated and used as fill at the Minker, Stout, Sullins, and Cashel residences. Sampling in 1974 by the Centers for Disease Control found a "trace" of 2,3,7,8-TCDD 100 feet east of the arena fence at a depth of 4 inches. EPA reinitiated an investigation of the site in May 1982. The arena is presently closed.

### Site Description (see map)

The site is a private horse arena and riding club in a rural setting, positioned on a terrace of the Romaine Creek floodplain. The open arena is 115 feet by 124 feet. If 850 cubic yards were excavated from the arena at a uniform depth, then approximately 19 inches would have been removed. EPA sampling in May 1982 showed 2,3,7,8-TCDD levels of 1.5 ppb to 95 ppb at depths to 12" in the arena, although the higher concentrations were found around the perimeter. No samples were taken at depths greater than 12". The excavated material was also placed at two locations at the ranch, as shown on the site map. Testing revealed no contamination in these areas at a 1 ppb detection limit. Resampling of these areas has been proposed.

Surface runoff from the arena drains about 165 feet to the southeast into a water course created by a spring on the property, which flows into Romaine Creek. Samples in this drainage area resulted in 2,3,7,8-TCDD levels up to 22 ppb, showing mobility of contamination out of the arena by erosion. Contamination has been found in Romaine Creek sediments downstream of the site at levels of 0.3 ppb and 0.74 ppb. This could be due to erosion from the Bubbling Springs Horse Arena or the Minker site or both.

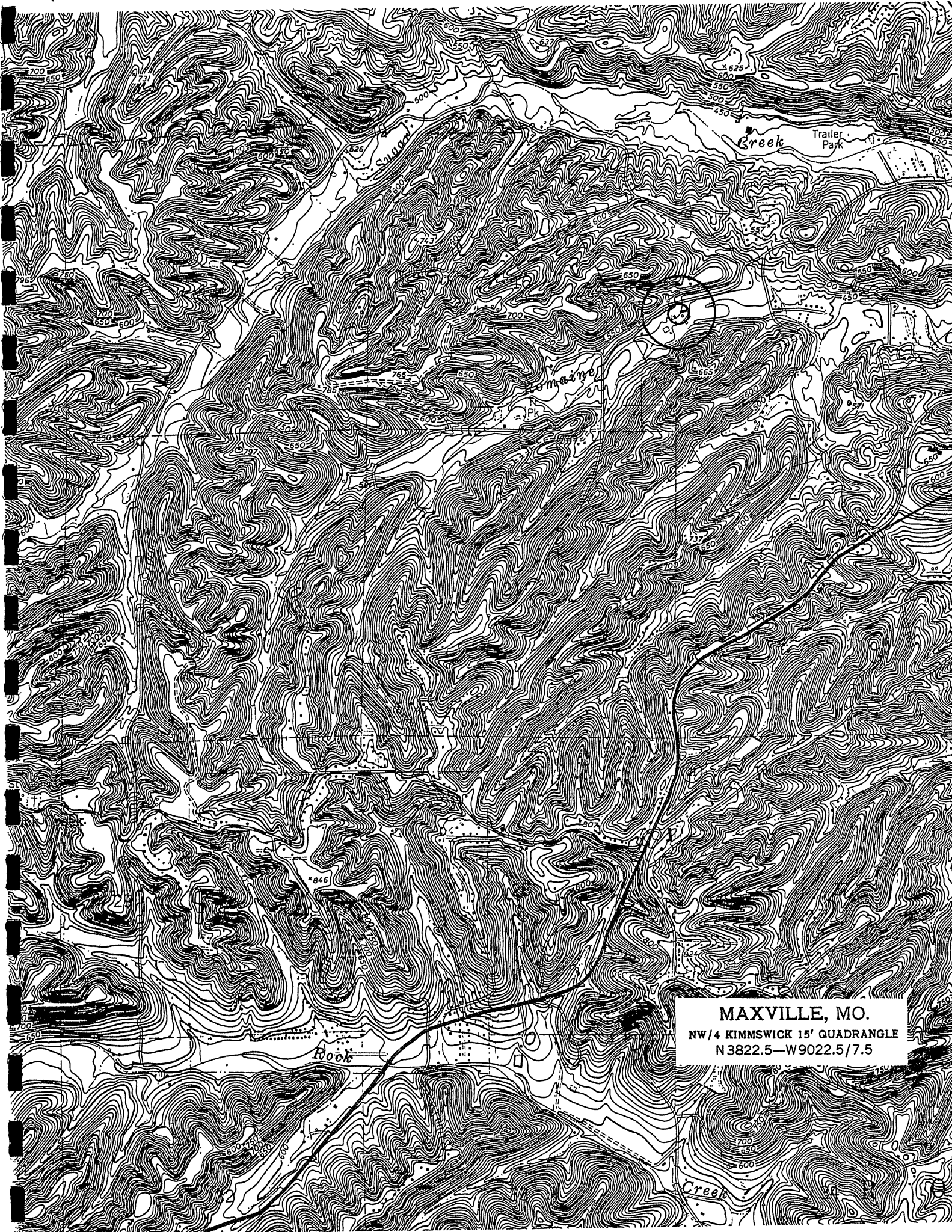
Those potentially affected are residences and visitors on the property and residences downstream adjacent to Romaine Creek.

### Geologic and Soils Description

Bubbling Springs Ranch is in the floodplain or on a terrace of the floodplain of the gaining portion of Romaine Creek. The soil of the Romaine Creek valley is derived from weathering of the Burlington-Keokuk limestone and associated Mississippian bedrock. The water table is probably about at the creek level. The spring on the property, for which the ranch is named, is part of a complicated groundwater system. Recharge to the spring is believed to be regional rather than local (see Romaine Creek site geology), and is not expected to carry contaminated sediment from the losing portion of Romaine Creek.

Soils in the area consist of fairly thick and clay rich alluvial deposits from the surface to about 5 feet to 12 feet deep, underlain by chert gravels. The surface soils would be gravelly or silty clays, with permeabilities probably in the range of  $10^{-5}$  to  $10^{-7}$  cm/sec. Contaminated sediments at the site are expected to remain near the surface and not threaten groundwater.



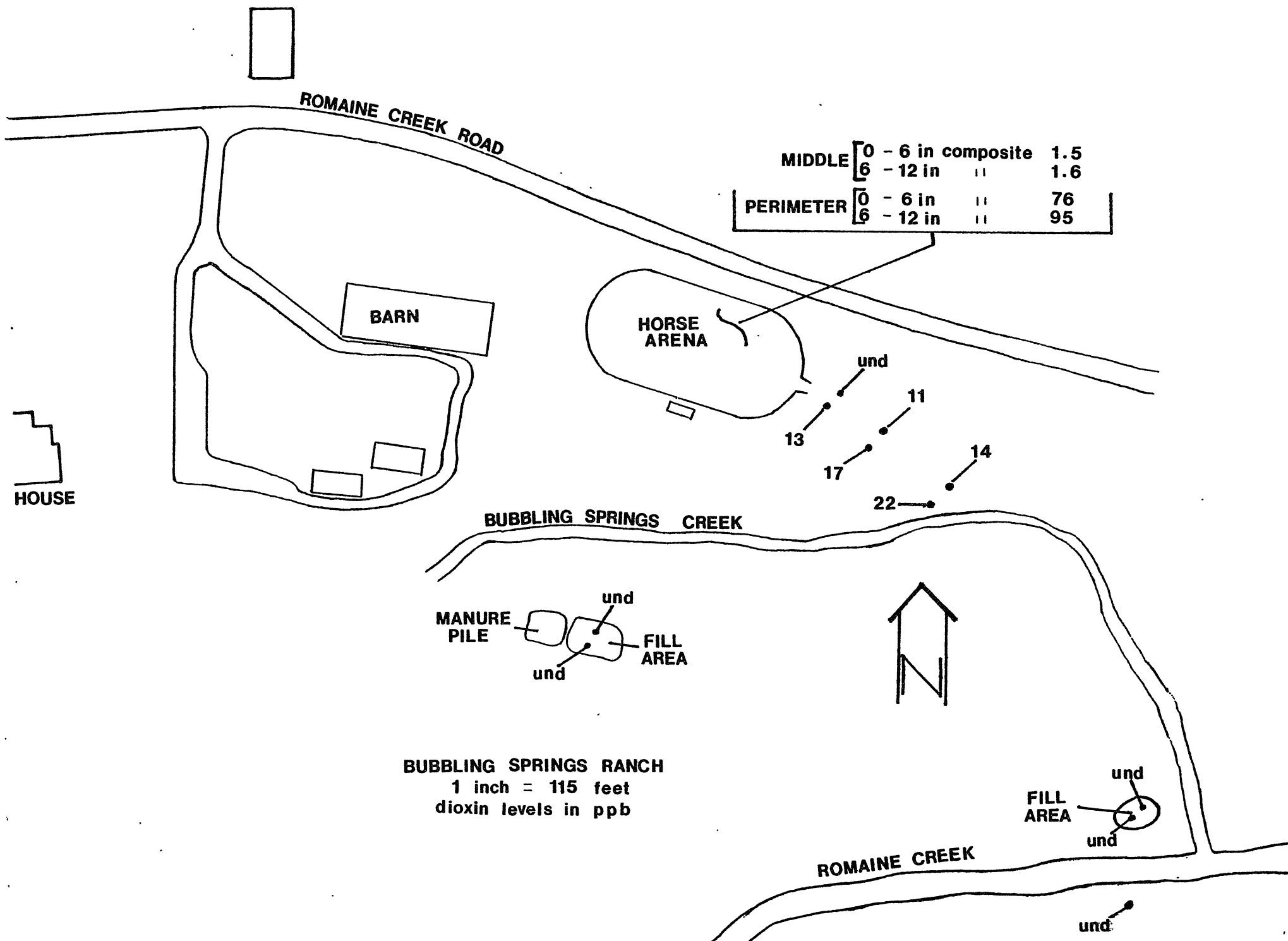


**MAXVILLE, MO.**

NW/4 KIMMSWICK 15' QUADRANGLE  
N3822.5—W9022.5/7.5









## CASHEL RESIDENCE

### Location

Legal Description: NW 1/4, SE 1/4, SE 1/4, Sec. 20,  
T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County  
Latitude: 38<sup>0</sup> 26' 41"  
Longitude: 90<sup>0</sup> 28' 44"

Address: 2306 Romaine Creek Road  
Fenton, Missouri

### Accessibility

From Missouri Highway 21, access is west on Rock Creek Road 1.3 miles (to the Minker site), then 0.3 miles north on West Romaine Creek Road. From Missouri Highway 141, go west on Romaine Creek Road and West Romaine Creek Road 3.8 miles. Rock Creek and Romaine Creek Roads are low type bituminous.

### History Summary

When the Bubbling Springs Ranch arena was excavated in 1973, Mr. Cashel flagged down 2 departing trucks and obtained 2 loads of dirt which he deposited in his garden. No vegetables grew in the garden and two apple trees died. Mr. Cashel subsequently scraped up the dirt and deposited it in a pile along the edge of his yard. EPA screening samples, taken in January 1983, showed positive 2,3,7,8-TCDD levels at 3 locations on the Cashel property.

### Site Description (see maps)

The Cashel property consists of about 0.9 acres, setting on a ridge top, along West Romaine Creek Road and adjacent to the Romaine Creek valley. Contaminated soil was confirmed at 2 small fill areas north of the house and along the 200 foot eastern property boundary, as shown on the site map. The samples were taken near the surface. A 2,3,7,8-TCDD level of 250 ppb was found in one of the small fill areas. The remainder showed levels of 10 ppb to 70 ppb. A more intensive sampling effort has been completed and results are not yet available.

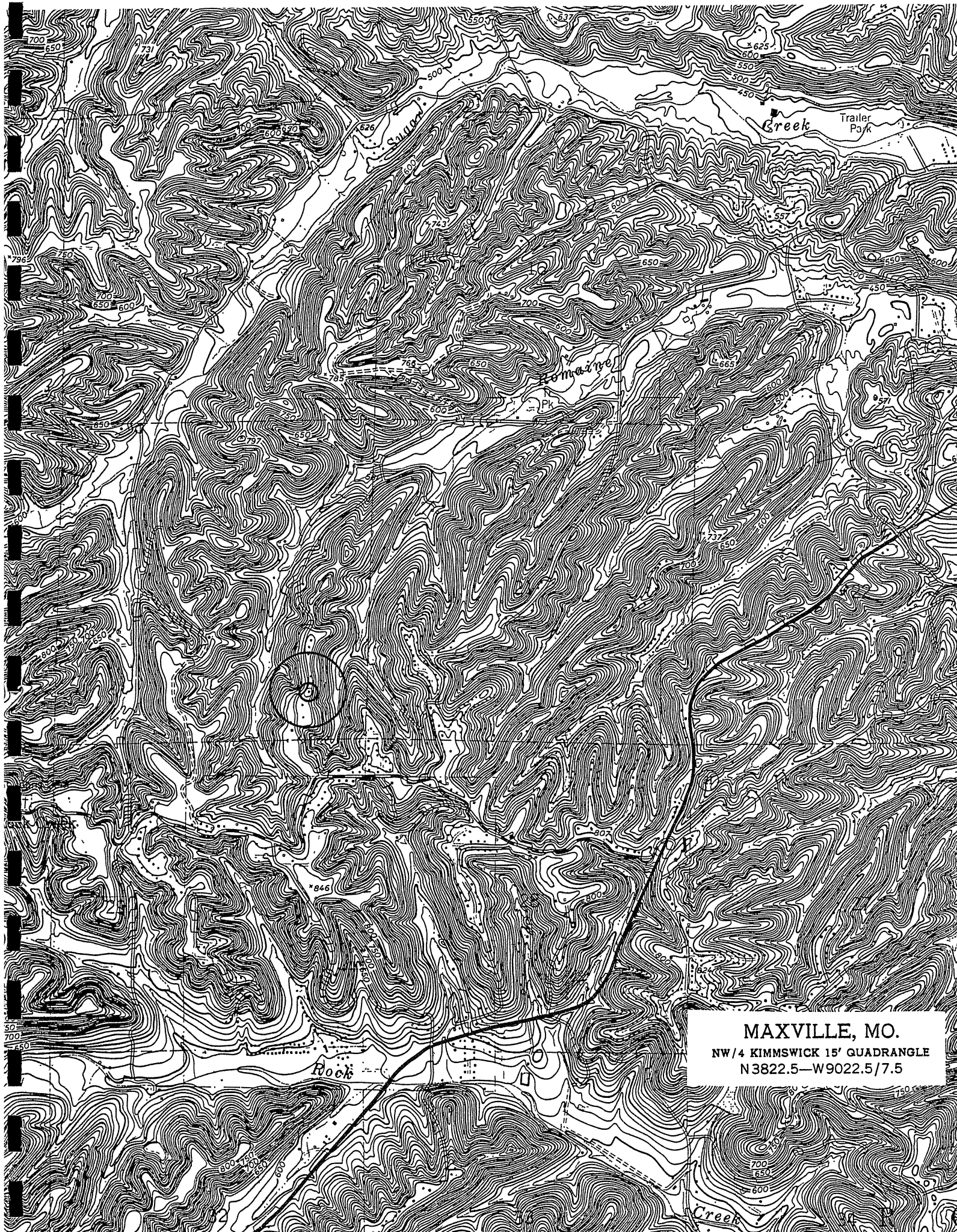
Residences are located on either side of the Cashel property.

## Geologic and Soils Description

The Cashel site lies in the same geologic setting as the Minker site, that being an upland setting underlain primarily by residual soil derived from weathering of a cherty limestone.

Being on a ridge top, the residual soil would be relatively thin, probably a few feet thick. This soil is predominantly clay, containing silt and chert gravel fragments, and would have a moderate to high permeability in its natural setting.

The contaminated fill material, originating from the Bubbling Springs Ranch horse arena, would be a gravelly or silty clay, probably with a higher silt content than the inherent soil.



**MAXVILLE, MO.**

NW/4 KIMMSWICK 15' QUADRANGLE  
N 3822.5—W 9022.5/7.5



WOODS

GARDEN

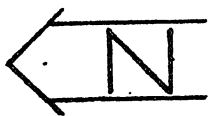
11 66 69 15

CONTAMINATED  
FILL AREAS

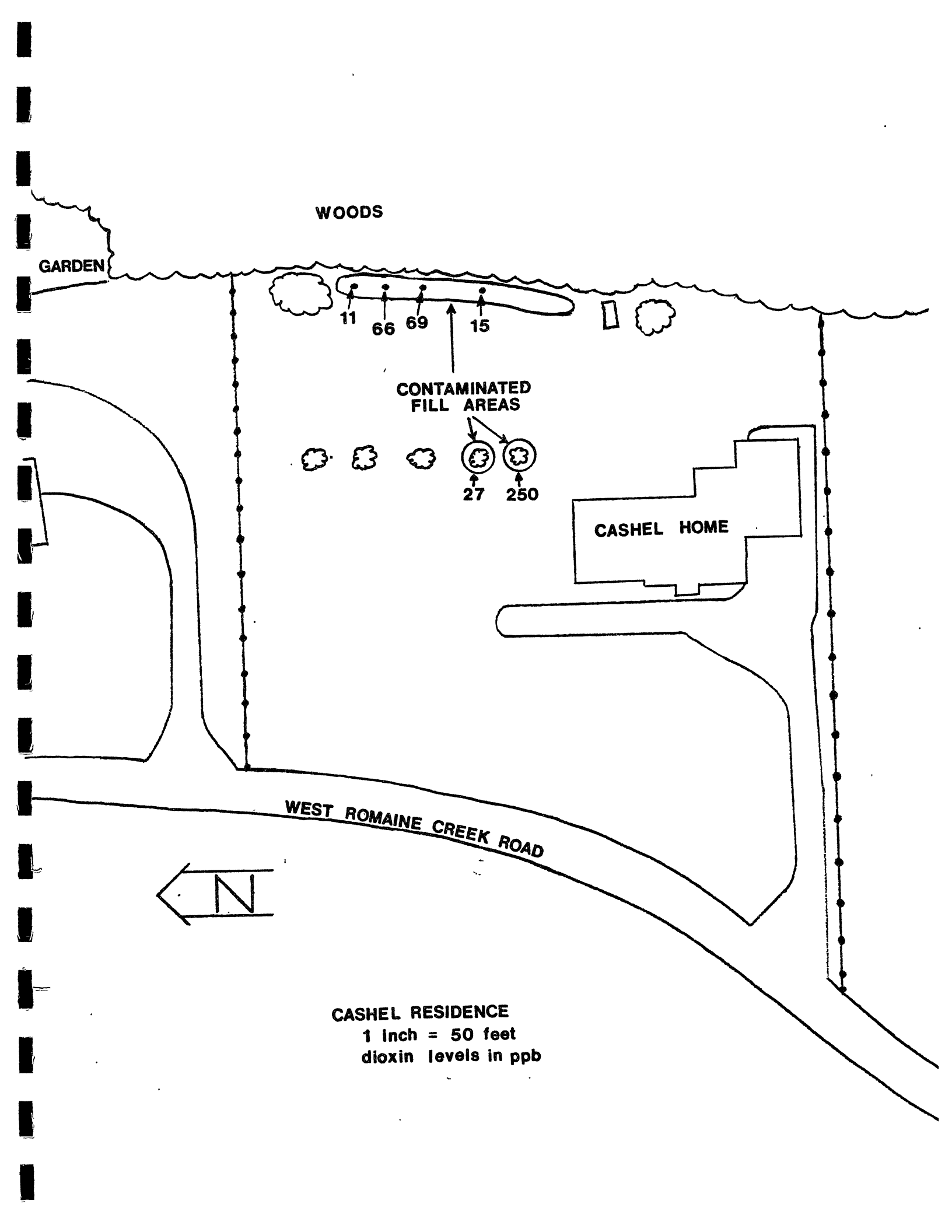
27 250

CASHEL HOME

WEST ROMAINE CREEK ROAD



CASHEL RESIDENCE  
1 inch = 50 feet  
dioxin levels in ppb







## MINKER RESIDENCE

### Location

Legal Description: Anita Acres, a resubdivision of the north half of Lot 35 of Sunset Acres Subdivision in U.S. Survey No. 1974

By extrapolation of section lines: SE 1/4, NE 1/4,  
NE 1/4, Section 29, T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County  
Latitude: 38° 26' 25"  
Longitude: 90° 28' 10"

Address: 4037 West Rock Creek Road  
Imperial, Missouri 63052

### Accessibility

Access is west approximately 1.3 miles from Missouri Highway 21 on West Rock Creek Road, or northwest approximately 1.3 miles from Missouri Highway 21 on Swaller Road and West Rock Creek Road. West Rock Creek and Swaller Roads are low type bituminous.

### History Summary

In June 1971, the Bubbling Springs Ranch horse arena was sprayed with contaminated waste oil. After several incidents of horse illnesses, about 850 cubic yards was excavated, in March 1973, of which an estimated 260 cubic yards was used for fill at the Minker residence. The Center for Disease Control sampled the site in 1974 and found levels of 2,3,7,8-TCDD ranging from 85 ppb to 740 ppb. This site along with Romaine Creek and the Stout Site is included on the National Priorities List. A State Superfund contract has been signed with the State for these three sites. The contract covers relocation and a feasibility study for the sites.

### Site Description (see maps)

The Minker Site lies at the head of Romaine Creek. The Minker house sits near the top of a ridge and the fill area is immediately to the south of the house. The toe of the fill abuts the neighboring yard. The fill was placed in a gully which carries storm drainage to Romaine Creek. Apparently, the fill began to erode almost immediately and most of the fill has now eroded downslope. Hence, the contaminated soil has been widely spread around other residences' yards downslope and into Romaine Creek. EPA sampling during 1982 and 1983 found 2,3,7,8-TCDD levels up to over 300 ppb. Volume of material has been estimated at 5000 to 8000 cubic yards for the Minker and Stout Sites combined.

Several homes are located across West Rock Creek Road from the Minker site. Samples from the yard of one residence were positive at levels from 1 to 10 ppb.

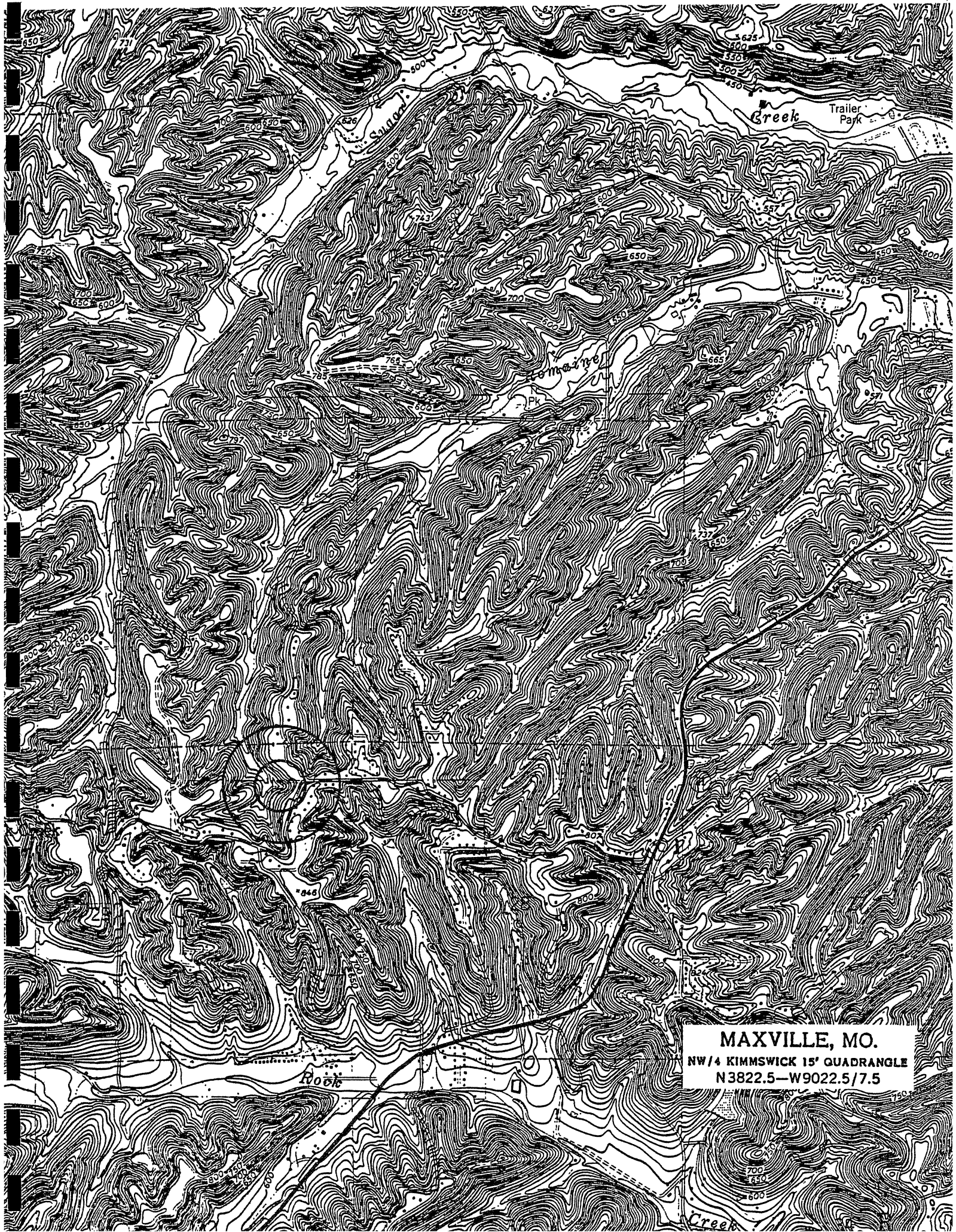
#### Geologic and Soils Description

The Minker Site is in an upland setting underlain primarily by residual soil derived from weathering of a cherty limestone. A surface veneer of loess is present in limited areas and is usually not a factor in construction projects in the area.

The thickness of the residual soil can range from a few feet upwards in excess of 80 feet. For an average thickness, an assumption of 20 feet is valid for residual soil on the uplands and hillslopes. The clay portion in this soil could be as high as 40% or 50% with most of the remainder of the fine textured portion being made up of silt. The coarser fraction consists of angular to subangular chert fragments and these may range from 10% to as much as 40% of the soil deposit.

The Romaine Creek valley contains material eroded from the residual soil on the hillslopes. Thus, most of the alluvial material is a chert gravel material, with the surface soil being silt rich. The Bubbling Springs horse arena is located on the floodplain of the Romaine Creek.

In conclusion, the contaminated material used as fill at the Minker Site was similar to the residual soil, but having a higher silt content. Due to being spread out by erosion and mixed with residual material, the contaminated soil is primarily a stoney clay.



**MAXVILLE, MO.**  
NW/4 KIMMSWICK 15' QUADRANGLE  
N3822.5—W9022.5/7.5



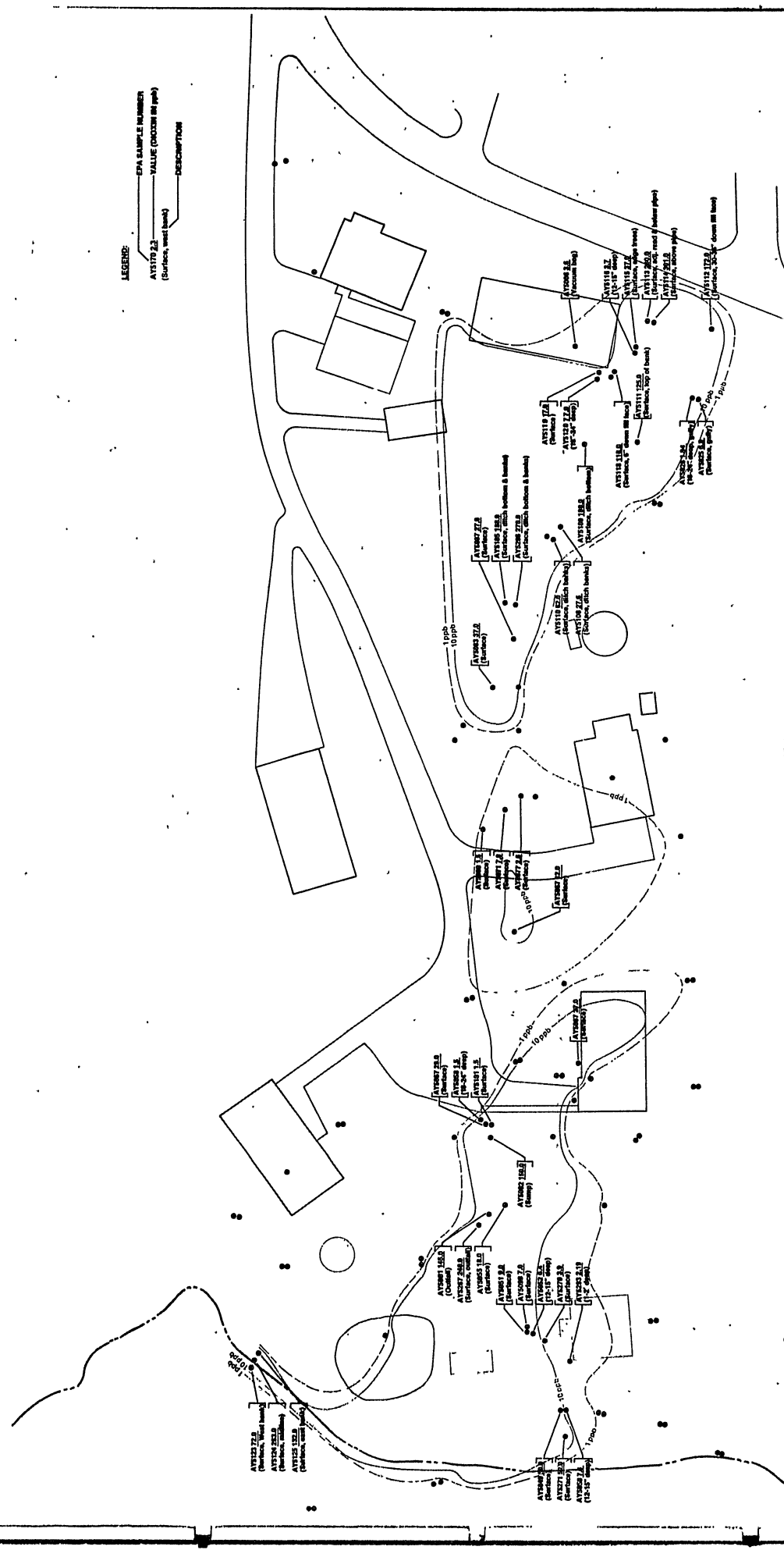
LEGEND:

EPA SAMPLE NUMBER	VALUE (GROSS IN PPB)	DESCRIPTION
ATV179.2.2		(Surface, water tank)

**FIGURE 4-5  
MINKER SITE MAP  
SAMPLE LOCATIONS**



PRELIMINARY



LEGEND

1 ppb ISOPLETH
10 ppb ISOPLETH



## ROMAINE CREEK

### Location

Begins: NE 1/4, Sec. 29, T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County

The creek flows approximately 5 miles northeasterly to enter the Meramec River at the Jefferson County - St. Louis County boundary.

### Accessibility

Romaine Creek Road and West Romaine Creek Road generally parallel the creek, with several crossings. The head of Romaine Creek can be entered from the Minker site. Romaine Creek Road is low type bituminous.

### History Summary

The Bubbling Horse Ranch horse arena, sprayed with contaminated waste oil in 1971, was the origin of the contaminated soil in Romaine Creek. When the arena was excavated and the material moved to the Minker Site, the soil began to erode and move into Romaine Creek. Contamination of Romaine Creek has come primarily from the Minker Site, and to a lesser extent, possibly from the Ruth Sullins property and the Bubbling Springs Ranch horse arena. The Romaine Creek site along with the Minker and Stout sites is included on the National Priorities List. A State Superfund contract has been signed with the State for these three sites. The contract covers relocation and a feasibility study for the sites.

### Site Description (see map)

The majority of contaminated stream sediment has been found within approximately one mile downstream of the Minker site, in the intermittent portion of the creek. 2,3,7,8-TCDD levels range up to 272 ppb, and generally decrease as the distance from the Minker site increases. Since the contaminated soil was transported into the creek by erosion, it generally does not extend outside of the creek banks. Contamination has been found down to two feet below the surface. Beyond one mile downstream of the Minker site, the 2,3,7,8-TCDD levels are near or less than 1 ppb. Contamination levels of 0.3 ppb and 0.79 ppb found downstream of the Bubbling Springs Ranch could have originated from either the horse arena or the Minker site. Contaminated soil is continuing to be moved during periods of rain. Due to the geology of the area, there is a potential for movement of soil particles in Romaine Creek into the subsurface and groundwater.

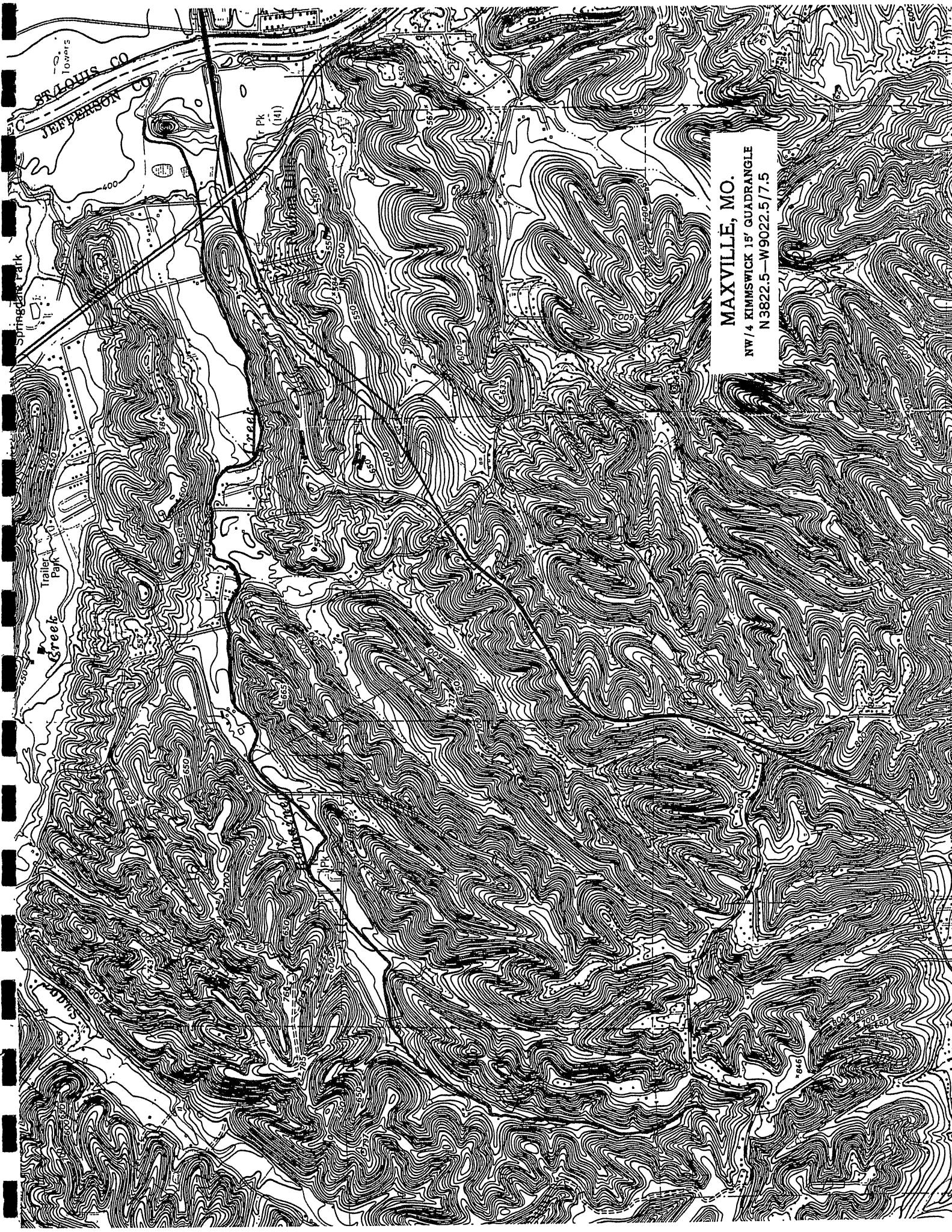


## Geologic and Soils Description

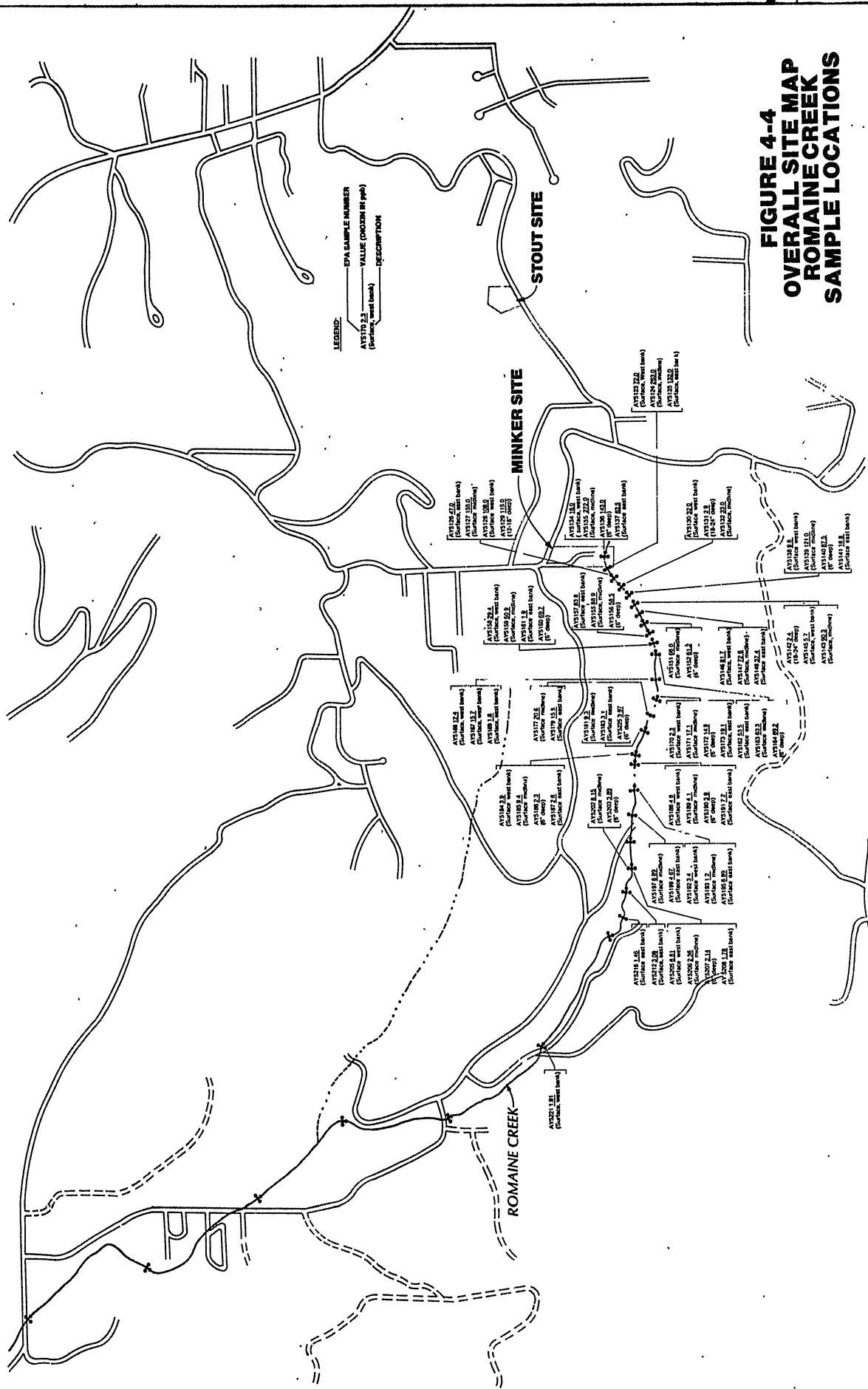
A highly permeable stoney clay residual soil exists in the upper Romaine Creek watershed, allowing movement of surface water into the subsurface probably including sediment transport 50 to 100 feet or more. The upper part of Romaine Creek, approximately one mile, is considered a losing stream. From the point of water flow, near the northwest corner of Sec. 21, T. 43 N., R. 5 E., a continuous and probably perennial flow would be expected all the way to the Meramec River.

The direction of flow of subsurface water lost into the upper watershed of Romaine Creek including the area of the Minker Residence is anticipated to be northeast. This water and possibly sediment would be expected to emerge as stream flow in the main stem of Romaine Creek or one of its tributaries. It is thought that Bubbling Springs would not receive this localized flow due to bedrock structure and lithologies. It is believed that groundwater recharge to Bubbling Springs is regional. A study currently being conducted by the U.S.G.S. and Missouri Division of Geology and Land Survey will further define the complex hydrology of the Romaine Creek Basin.

It appears that contaminants eroded from the horse arena at Bubbling Springs would not recharge groundwater, but would move into Romaine Creek and stay in the stream channel to its conjunction with the Meramec River.



MAXVILLE, MO.  
NW 1/4 KIMMICK 15' QUADRANGLE  
N 3822.5 - W 9022.5 / 7.5



**FIGURE 4-4  
OVERALL SITE MAP  
ROMAINE CREEK  
SAMPLE LOCATIONS**

## RUTH SULLINS PROPERTY

### Location

Legal Description: NW 1/4, NE 1/4, NW 1/4, Sec. 21,  
T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County  
Latitude: 38° 27' 36"  
Longitude: 90° 28' 06"

Address: 1680 Romaine Creek Road  
Maxville, Missouri 63026

### Accessibility

Access is west approximately 2.5 miles from Missouri Highway 141 on Romaine Creek Road. The site is about 1 mile west of the Bubbling Springs Stables site. Alternate access is to enter Romaine Creek Road from the south, via Missouri Highway 21, then West Rock Creek Road or Swaller Roads. Romaine Creek, West Rock Creek, and Swaller Roads are low type bituminous.

### History Summary

The contaminated soil originated from Bubbling Springs Arena. About 14 cubic yards was hauled to the Sullins Property and used to fill a depression caused by the removal of a large tree.

### Site Description (see maps)

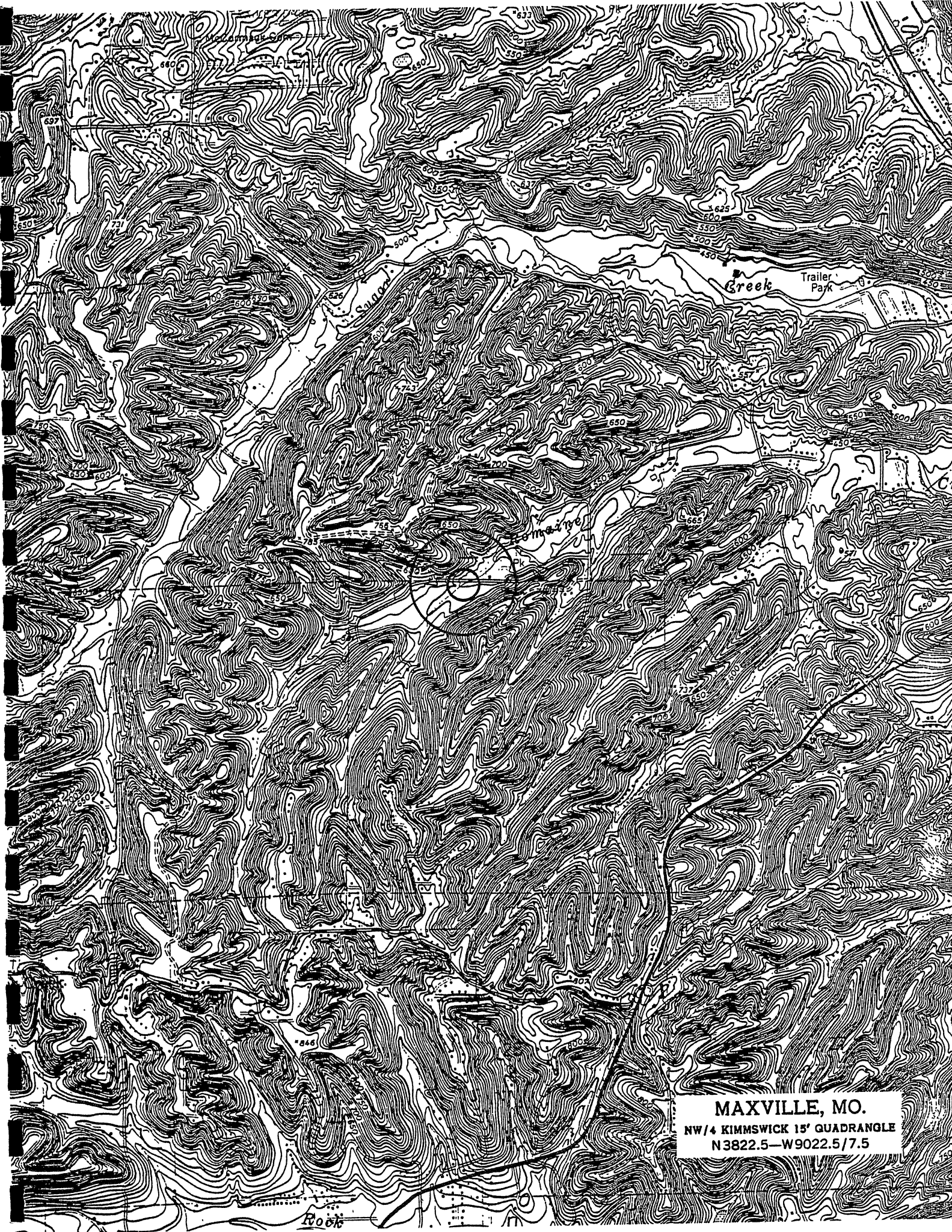
The property lies between Romaine Creek and Romaine Creek Road and comprises about 0.9 acres. The fill area is approximately 20 feet x 20 feet and from 6 inches to 3 feet deep. It is located about 200 feet east of the Sullins house and 20 feet west of Romaine Creek. The initial screening investigation by U.S. EPA showed 2,3,7,8-TCDD at levels of 99 ppb. Follow up sampling showed no movement of contaminated soil and levels as high as 820 ppb in the fill area.

Residences surrounding the site are, one home directly across Romaine Creek Road from the Sullins house and a trailer court across the road northeast of the fill area. The trailer court is also adjacent to Romaine Creek and downstream of the fill area.

Geologic and Soils Description (see also Romaine Creek and Bubbling Springs)

The natural composition of the Romaine Creek stream valley is a chert gravel material overlain by a silt rich surface soil, all eroded from the residual soil of the uplands. A typical sample of the surface soil could be as much as 40 to 50 percent clay with the remainder of the fine textured portion being made up of silt. The fill material would fall into this description due to the location of Bubbling Springs Arena, which was the source of the fill.





MAXVILLE, MO.  
NW/4 KIMMSWICK 15' QUADRANGLE  
N3822.5—W9022.5/7.5

Rock

HOUSE

TRAILER  
COURT

WEST ROMAINE CREEK ROAD

CONTAMINATED  
FILL AREA

SULLINS  
HOME

CREEK

ROMAINE



RUTH SULLINS PROPERTY  
1 inch = 50 feet

## STOUT RESIDENCE

### Location

Legal Description: U.S. Survey No. 1974

By extrapolation of section lines:  
SW 1/4, NE 1/4, SE 1/4  
Section 29, T. 43 N., R. 5 E., 5th P.M.  
Maxville Quadrangle  
Jefferson County  
Latitude: 38° 26' 0"  
Longitude: 90° 28' 05"

Address: West Swaller Road  
Imperial, Missouri 63052

### Accessibility

Access to the site is northwest approximately 0.7 mile from Missouri Highway 21 on Swaller Road. Swaller Road is low type bituminous.

### History Summary

In June 1971, the Bubbling Springs Ranch horse arena was sprayed with contaminated waste oil. After several incidents of horse illnesses, about 850 cubic yards was excavated, in March 1973, of which the majority was used for fill at the Stout Site. The Center for Disease Control sampled the site in 1974 and found levels of 2,3,7,8-TCDD in the range of 170 ppb to 440 ppb. This site along with Romaine Creek and the Minker Residence Site is included on the National Priorities List. A State Superfund contract has been signed with the State for these three sites. The contract covers relocation and a feasibility study for the sites.

### Site Description (see maps)

The Stout Site sits slightly to the east side of a north-south ridge. The fill material was used to make a level lot for two trailer pads. Reportedly, the fill operation was already in progress when the contaminated soil was brought to the site. Contamination was found throughout the fill by EPA sampling at levels from 1.0 ppb to 300 ppb, down to a depth of 20 feet. It is believed that 20 feet is the maximum depth of fill at any point. Volume of material has been estimated at 5,000 to 8,000 cubic yards for the Minker and Stout Sites combined.



## Geologic and Soils Description

The Stout Site is in an upland setting underlain primarily by residual soil derived from weathering of a cherty limestone. A surface veneer of loess is present in limited areas and is usually not a factor in construction projects in the area.

The thickness of the residual soil can range from a few feet upwards in excess of 80 feet. For an average thickness, an assumption of 20 feet is valid for residual soil on the uplands and hillslopes. The clay portion in this soil could be as high as 40% or 50% with most of the remainder of the fine textured portion being made up of silt. The coarser fraction consists of angular to subangular chert fragments and these may range from 10% to as much as 40% of the soil deposit.

Surface runoff at the Stout Site would travel in a south-southeasterly direction to enter the main stem of Rock Creek east of Country Club Manor.

The contaminated fill originated from the floodplain of the Romaine Creek Valley, which consists of eroded material from the hillslopes, a clay and chert gravel material with a silt rich surface soil. Thus, the fill would partly consist of a stoney, silty clay material.



**MAXVILLE, MO.**

NW/4 KIMMSWICK 15' QUADRANGLE  
N3822.5—W9022.5/7.5

PRELIMINARY

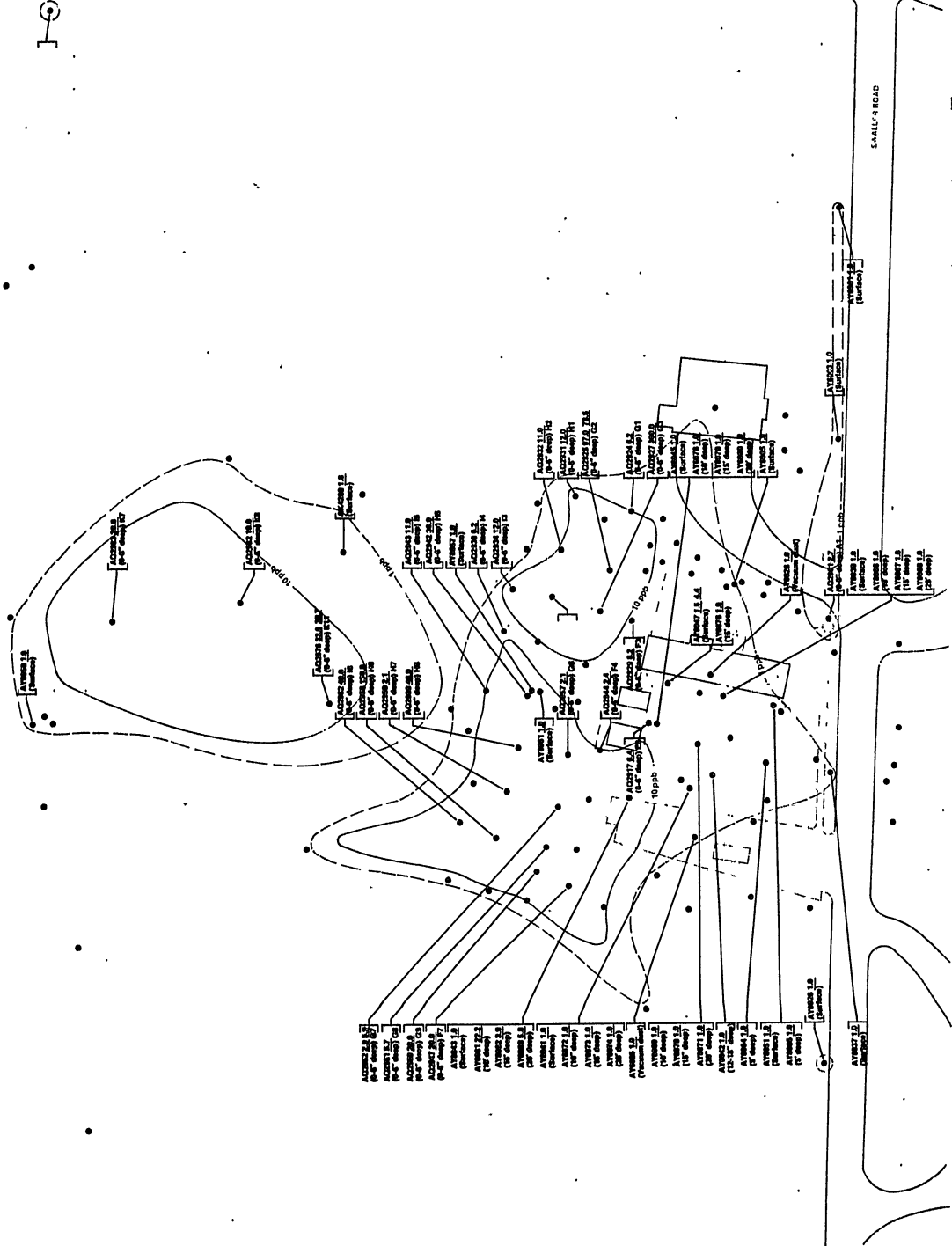
FIGURE 4-6  
STOUT SITE MAP  
SAMPLE LOCATIONS

LEGEND:  
EPA SAMPLE NUMBER  
VALUE (micrograms per gram)  
(Surface, wet weight)

NOTE:  
THE FOLLOWING SAMPLES DO NOT  
APPEAR ON THIS DRAWING:

AKG18 1.5  
BACKGROUND FROM HWY 71, 2 MILES  
EAST OF WALLER ROAD  
AKG18 1.5  
CENTER OF YARD S. OF  
B-BALL COURT  
ATW18 1.8  
CENTER OF YARD S. OF  
B-BALL COURT  
ATW18 1.8  
YARD AT SW CORNER  
OF B-BALL COURT  
ATW23 1.8  
ALSO AT FIELD BY  
ALSO AT FIELD BY  
ON HWY 218 WALLER RD.  
ATW23 1.8  
ROCK CREEK BEHIND  
BASEBALL FIELD  
AK G23 1.5  
ALSO AT FIELD BY  
OF DRIVEWAY & 4' EAST  
OF FENCE  
ALSO:  
AKG28  
ATW22  
AK1357  
AK1357  
AK1357  
AK1357

LEGEND  
1 ypb. ISOPHLETH  
10 ypb. ISOPHLETH  
SCALE IN FEET



## SADDLE AND SPUR CLUB

### Location

Legal Description: SW 1/4, SW 1/4, Sec. 10,  
T. 43 N., R. 4 E., 5th P.M.  
House Springs Quadrangle  
Jefferson County

Address: Little Antire Road  
High Ridge, Missouri 63049

### Accessibility

The riding club lies on the west side of Little Antire Road, between County Road PP and Antire Road. From Interstate 44, go 2.7 miles south on Antire Road, then 0.5 miles south on Little Antire Road. From Missouri Highway 30, go west 1.7 miles on County Road PP, then north 1.1 miles on Little Antire Road. All access roads are bituminous.

### History Summary

The horse arena at the riding club was sprayed with contaminated waste oil in 1972. Since that time, large quantities of sand have been brought into the arena. The arena soil has also been tilled to a depth of approximately 12 inches. Fuel oil and salt have been used in the area as herbicides. U.S. EPA did an initial screening sampling in December 1982, which showed 2,3,7,8-TCDD levels between 4.9 ppb and 16 ppb, in the arena and the drainage area northwest of the Arena. Follow up sampling was completed in the spring of 1983.

### Site Description

The 3.5 acre riding club sits between Little Antire Road and Antire Creek. The arena is open and sits at the lower end of the property. Samples in the arena have not been taken at depths greater than 8 inches. The drainage area was sampled at 18 to 36 inches and no contamination was found. Residences are located 500 feet to the south. Ball fields sit on the adjacent property to the north. 2,3,7,8-TCDD was detected below 1 ppb just outside of the club property. Samples in Antire Creek were negative; however, contamination is fairly widespread in the drainage area between the arena and the creek.

### Geologic and Soils Description

The horse arena at the riding club sits on a terrace of the Antire Creek floodplain. Sediments in the floodplain consist of a 4 to 6 foot thick layer of silt loam to silty clay, underlain by more permeable subsoil

deposits. The upper 4 to 6 feet would be expected to have a coefficient of permeability of  $10^{-6}$  cm/sec to  $10^{-5}$  cm/sec, or 1 to 10 feet/year. The subsoil ranges from sandy loam to gravel with a binder of clayey sand or silt. Permeability here would be higher, especially where sand and gravel lenses exist.

Bedrock in the area is the Plattin limestone formation, which can have high permeability resulting from solution enlarged openings. However, several factors indicate that there is a reduced risk of groundwater recharge in the Saddle and Spur Club area. The stream adjacent to the horse arena and upstream and downstream is gaining. The water table is relatively high and there is a reasonably low hydraulic gradient between this area and major streams within the region. Also, there have been no observed solution enlarged openings of significant consequence in the area.

Surface erosion does occur easily during storms. This would be the most likely means for contaminant transport off site.



UNITED STATES  
DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS

7861 II SE 1.3 MI. TO I-44 & U.S. 50  
(MANCHESTER)

35'

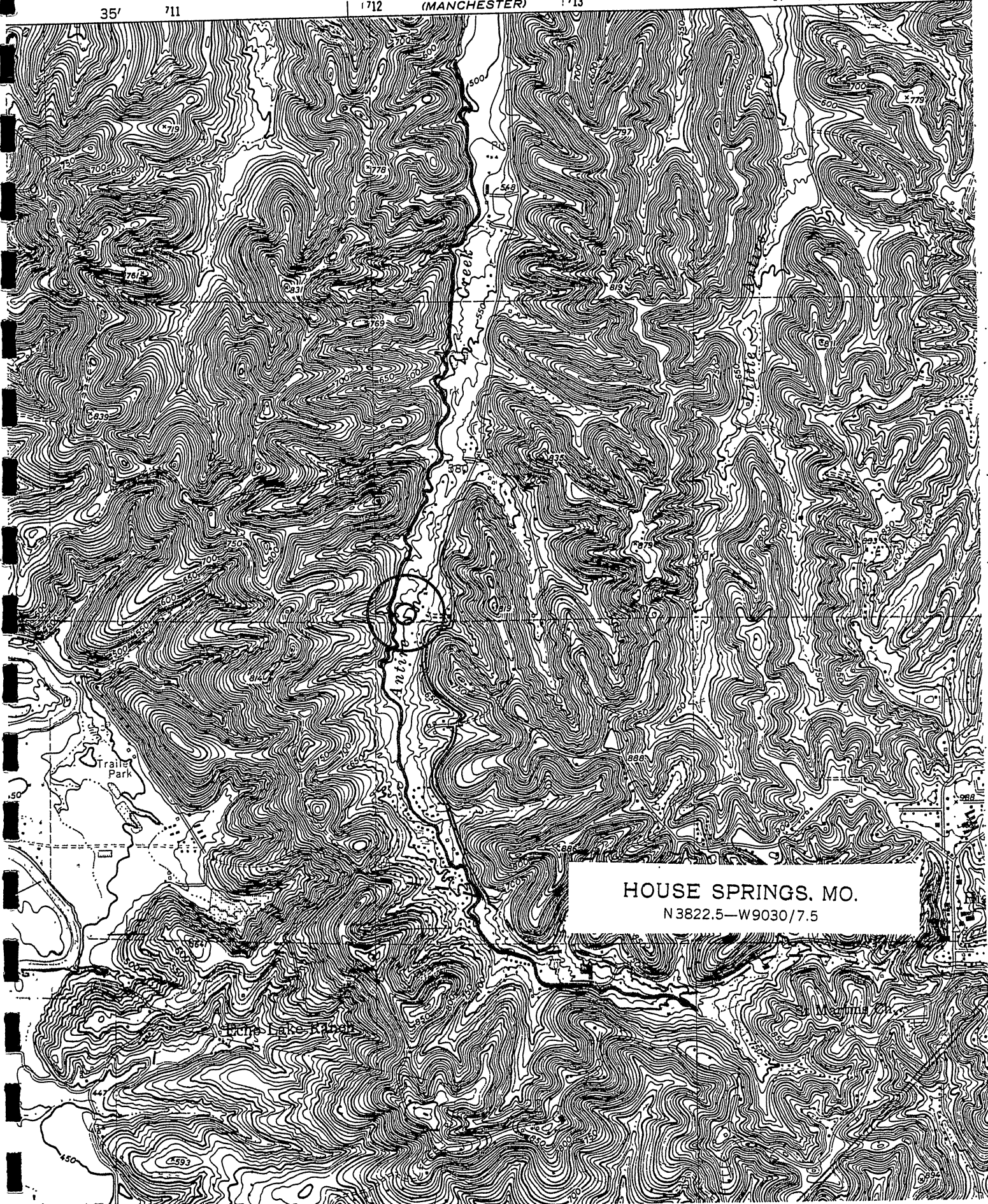
711

712

714

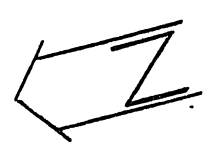
32'30"

45



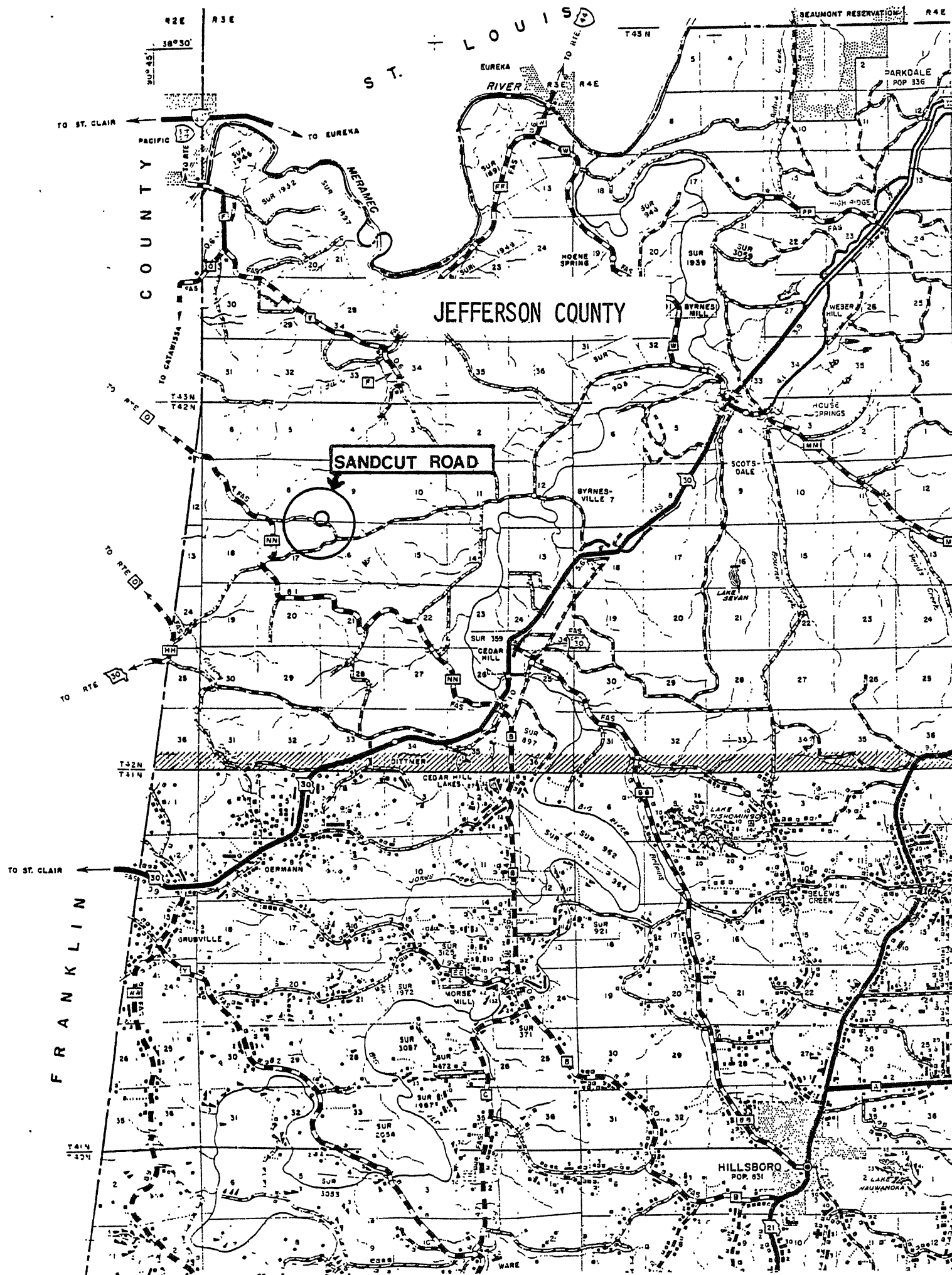
HOUSE SPRINGS, MO.

N3822.5—W9030/7.5

[illegible]

SADDLE AND SPUR  
RIDING CLUB  
1 inch = 92 feet

 $\alpha = \text{less than detection limit}$





## SANDCUT ROAD

### Location

Legal Description: NW 1/4, NW 1/4, Sec. 16,  
T. 42 N., R. 3 E., 5th P.M.  
Pacific Quadrangle  
Jefferson County

Address: Route 1  
Sandcut Road  
Catawissa, Missouri 63015

### Accessibility

To reach Sandcut Road from I-44, go south at the Pacific exit on Route F to Route O. Go south on Route O to Route NN. Go approximately 4 miles south on Route NN to Sandcut Road on the left. From Missouri Highway 30, to northwesterly about 6.5 miles on Route NN to Sandcut Road on the right. Lacy Manor Road lies about 0.8 mile east of Route NN off of Sandcut Road. Sandcut Road is gravel.

### History Summary

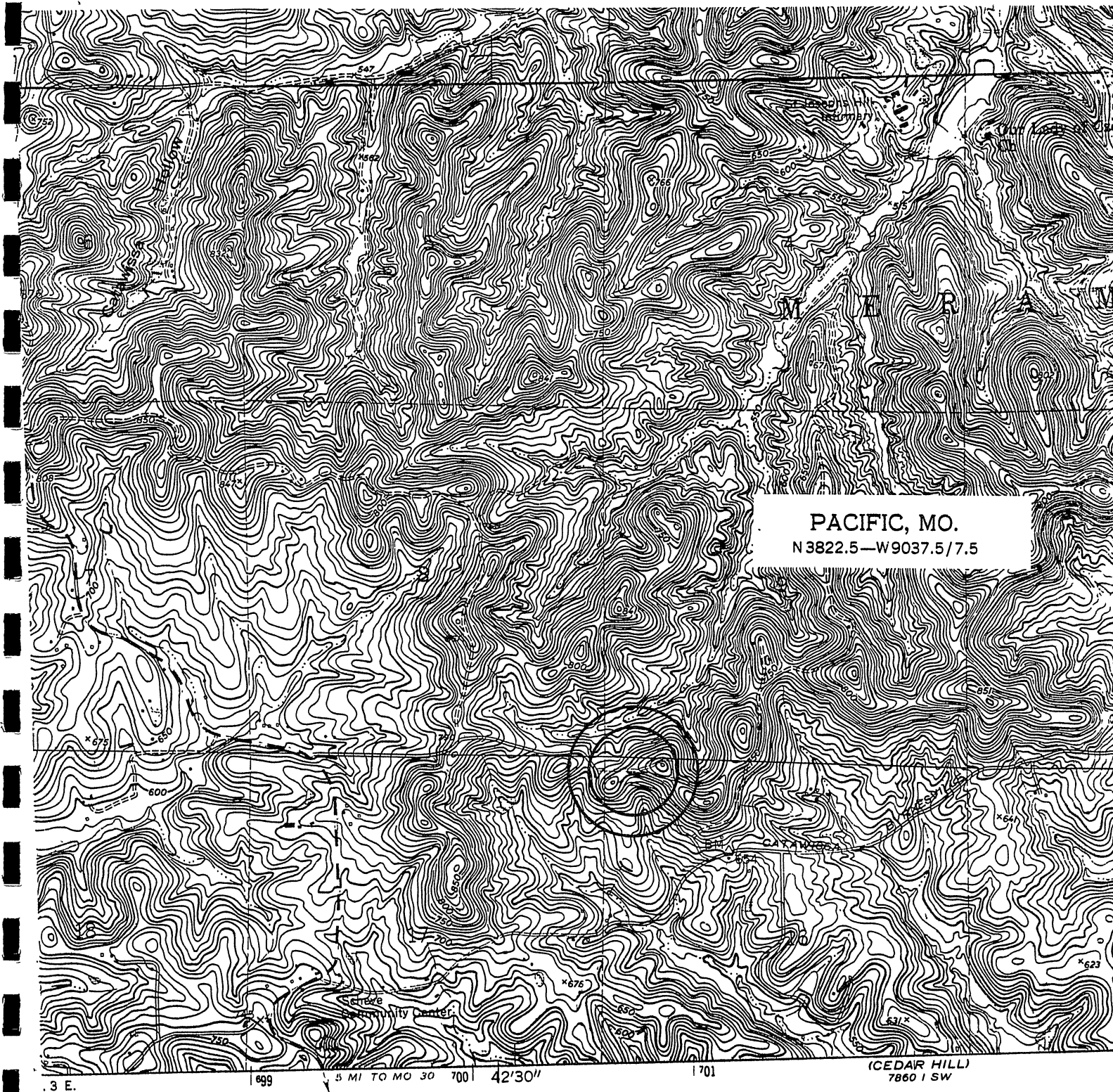
A former driver for Bliss Oil Co. lived along Sandcut Road and on several occasions oiled the roads near his dwelling. EPA sampling in February 1983 found 2,3,7,8-TCDD levels from 1 ppb to 25 ppb.

### Site Description (See Map)

The contaminated road is acutally Lacy Manor Road and a half-circle drive off of Lacy Manor which is a private drive for a mobile home residence. The area lies near the top of a ridge, with the trailer at the highest point. A composite from the driveway at 0 to 6 inches had 2,3,7,8-TCDD at 25 ppb. Lacy Manor Road in front of the residence had 5 ppb, also at 0 to 6 inches. The nearest residence lies about 1000 feet to the east on the circle portion of Lacy Manor Road.

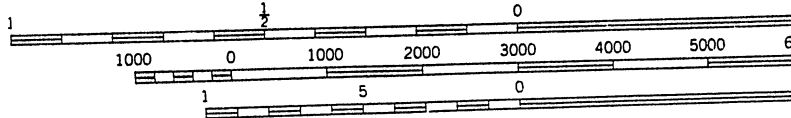
### Geologic and Soils Description

Not available.



PACIFIC, MO.  
N 3822.5 - W 9037.5 / 7.5

SCALE 1:24 000



CONTOUR INTERVAL 10 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1974 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS  
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225. OR RE  
AND BY THE DIVISION OF RESEARCH AND TECHNICAL INFORMATION  
MISSOURI DEPARTMENT OF NATURAL RESOURCES, ROLLA, MISSOURI  
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE

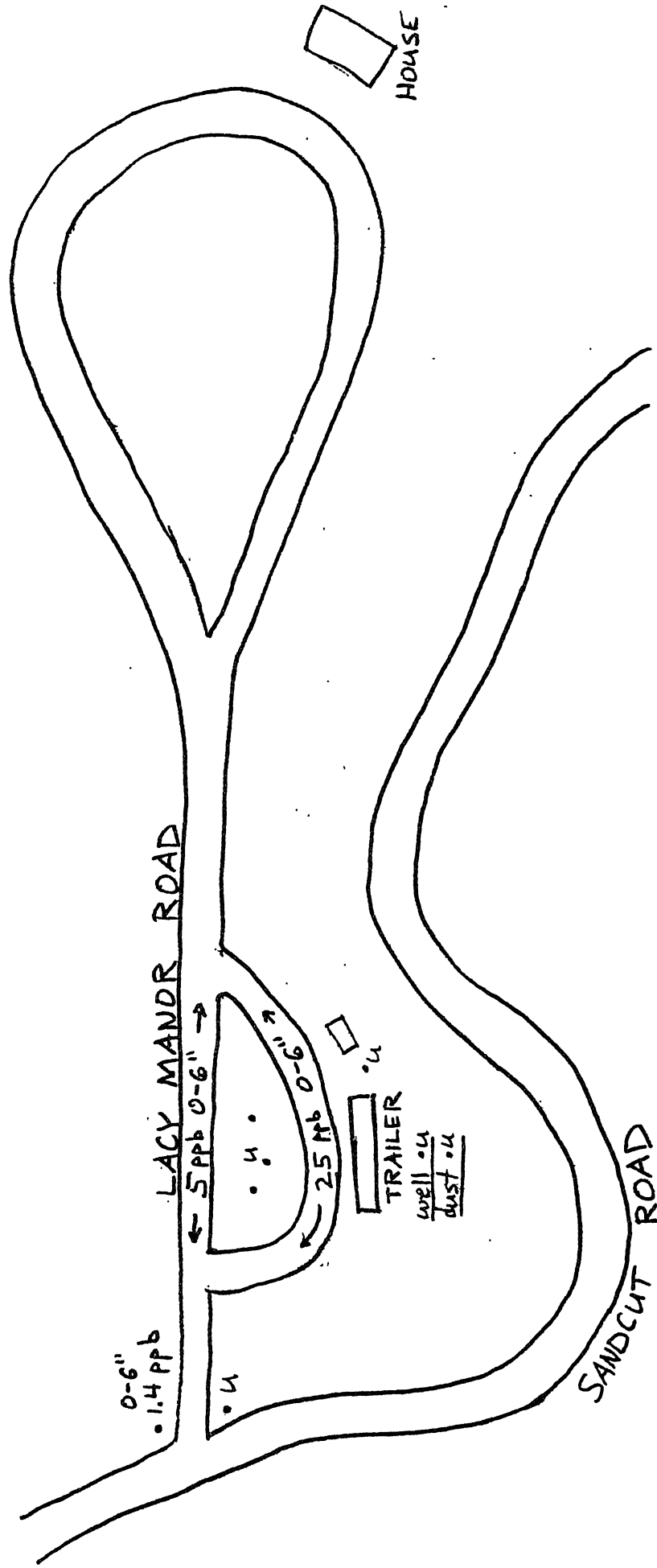
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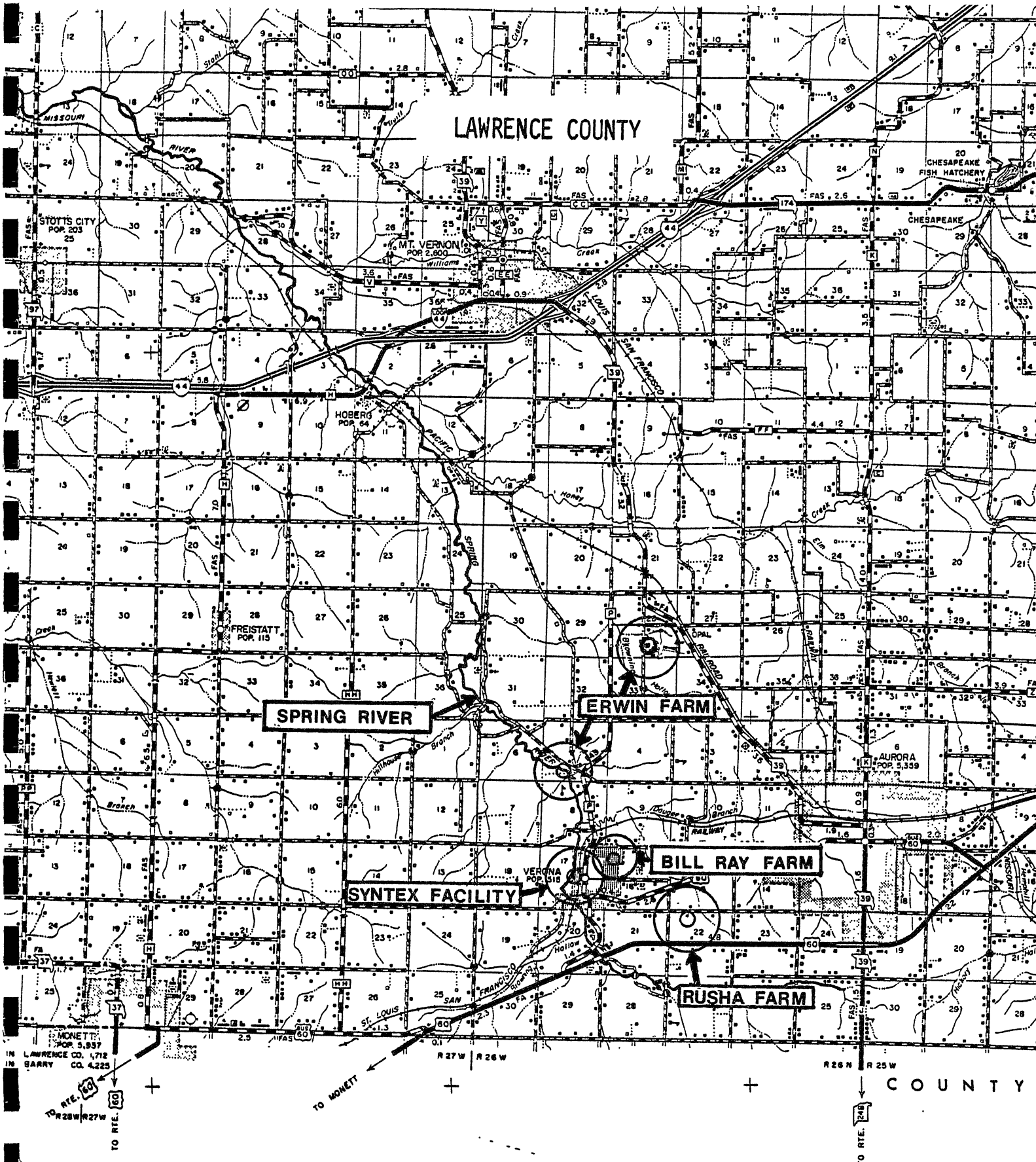
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SANDCUT ROAD

NO SCALE

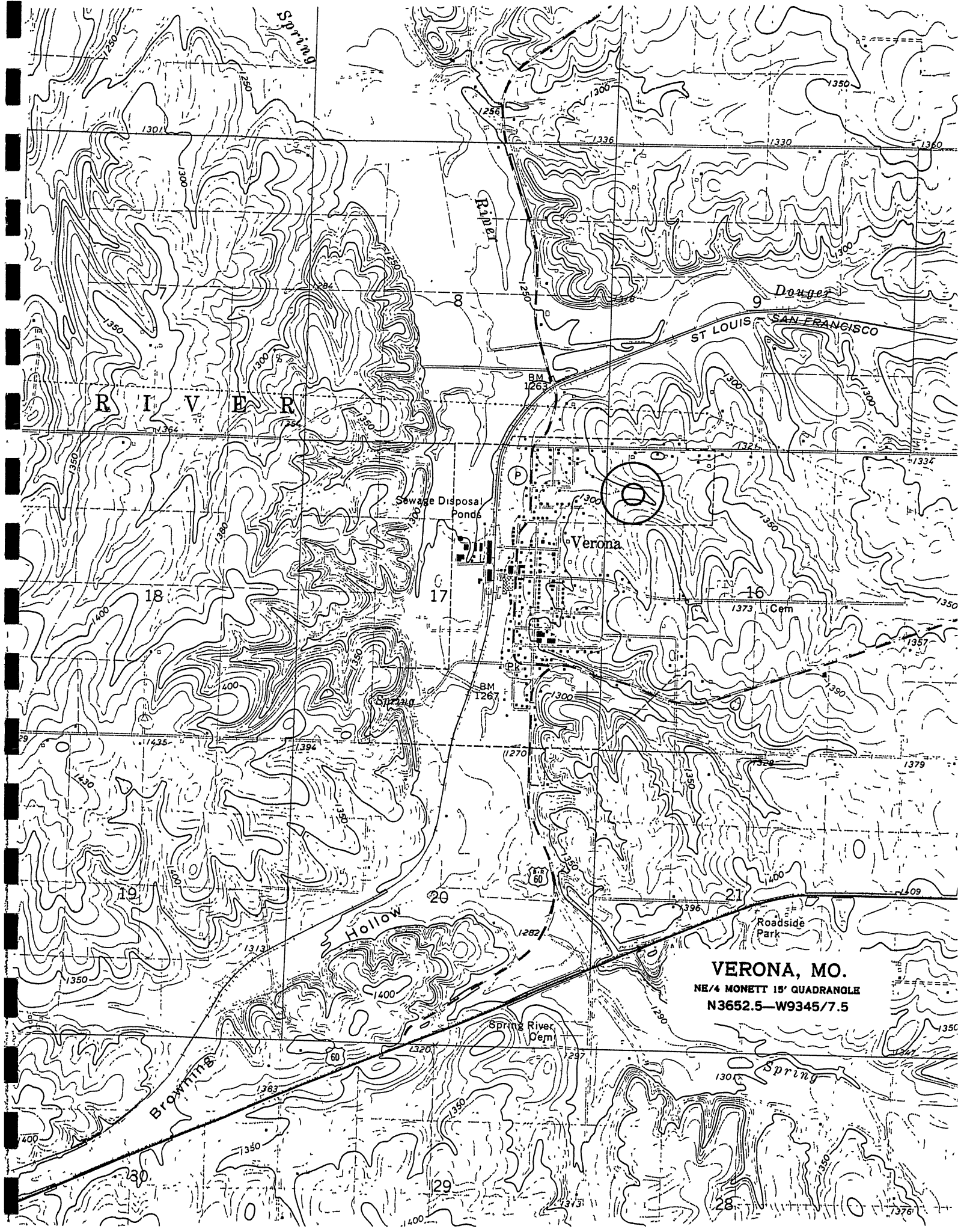
$u$  = less than detection limit



12-1-73
2-2-78
DATE

## BILL RAY FARM

The two drums of filter clay material at the Bill Ray Farm were overpacked in new drums at the site. Syntex Agribusiness, Inc. agreed to provide secure storage for the drums.



**VERONA, MO.**

NE 1/4 MONETT 15' QUADRANGLE  
N3652.5-W9345/7.5

## ERWIN FARM

### Location

Legal Description: Barn (Drum Location)  
SW 1/4, SE 1/4, Sec. 28  
T. 27 N., R. 26 W., 5th P.M.  
Mt. Vernon Quadrangle  
Lawrence County

Principal Farm  
SW 1/4, Sec. 5, T. 26 N.  
R. 26 W., 5th P.M.  
Verona Quadrangle  
Lawrence County

### Accessibility

The Erwin barn (drum location) is located about 3.5 miles north of Verona, and about 2 miles north northeast of the principal farm. It is about 1/2 mile east of County Road P, on the east side of a north-south gravel road.

The principal farm areas lie about 1.5 miles north of Verona, west of County Road P, accessible by the Erwin Farm lanes.

### History Summary

Problems of pollution on the S. B. Erwin farm by the former Hoffman-Taft plant in Verona date back to 1961, when water quality problems in the Spring River started. These water quality problems apparently intensified in 1970 and 1971 during NEPACCO's operation of the plant. Mr. Erwin had further association with NEPACCO in 1971 when he took about 35 drums of their filter material. This material was an expendable clay filter material used to purify hexachlorophene, and it was believed to control foot rot in cattle. Mr. Erwin dumped the material in two gate areas and around two feed and salt lick areas. The drums were then stored in a barn on another part of his property.

During the EPA investigation in July, 1981, areas sampled were two gate areas, one salt lick area, and a composite of residue left in the drums. Also sampled was sediment in a spring which had become very polluted in 1970 and 1971. It was learned after sampling that gate area 1 had been largely washed out in a flood in the 1970's, and the hole had been filled in with stream gravel. Also, after sampling, the barn containing the drums had been burned down, and the drums were stored, upside down, in a nearby shed.

### Site Description (see map)

The Erwin Farm had 200+ beef cattle at the time of the investigation. With the exception of the former barn, all of the contaminated areas lie in the Spring River floodplain. 2,3,7,8-TCDD levels were:

Drums	8700 ppt
Gate Area 1	830 ppt
Gate Area 2	280 ppt
Salt Lick Area	.36 ppt
Spring	6 ppt

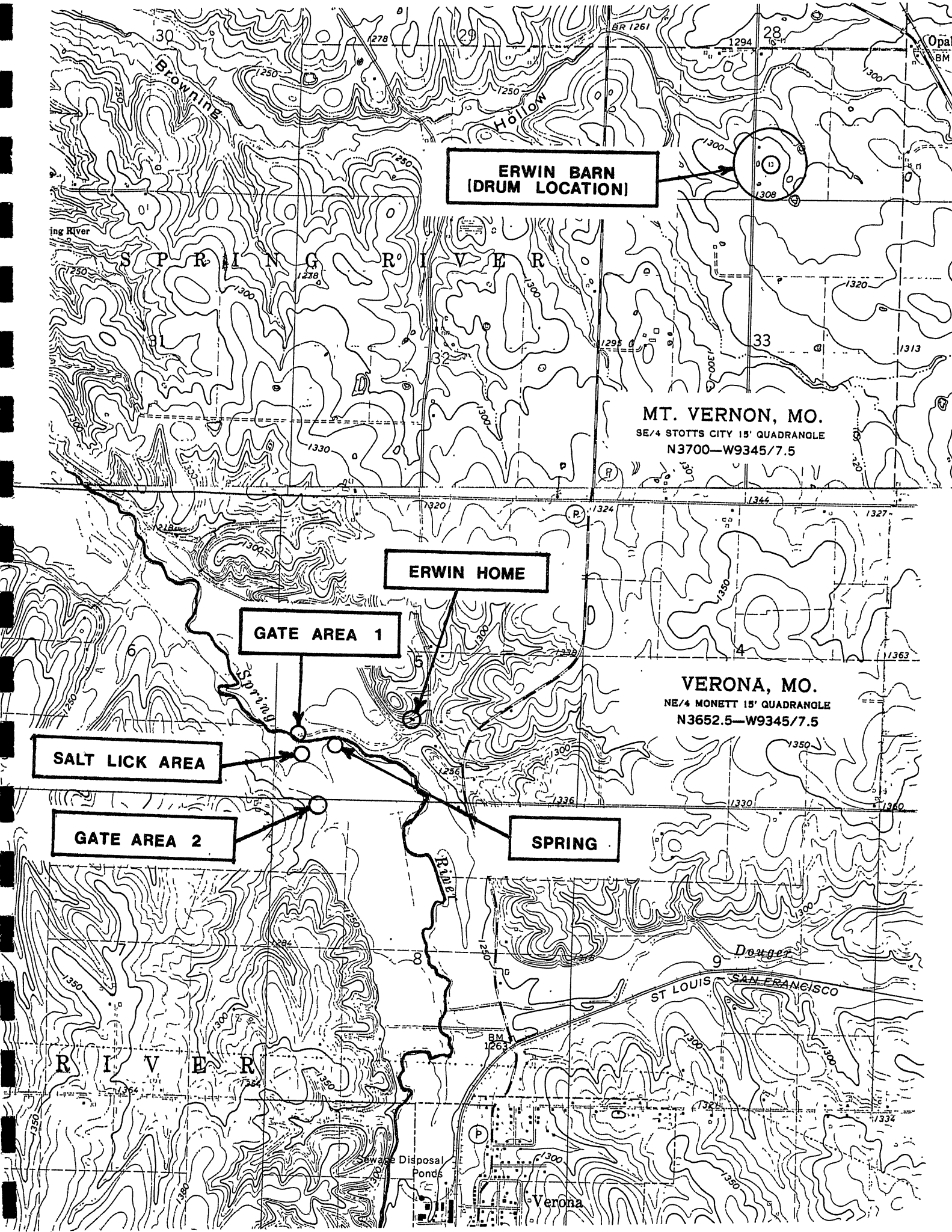
A point of interest is that later sampling of clay filter material at the Denney Farm site resulted in 1,100 ppb, although this level probably resulted from other materials in the trench.

Farms that border the Erwin Farm upstream and downstream are also cattle (beef and milk) operations.

### Geologic and Soils Description

The area is generally that of a karst topography, with limestone and chert bedrock, silty clay residual soil, and some loess on ridge tops.





## RUSHA FARM

### Location

Legal Description: NW 1/4, NW 1/4, Sec. 22,  
T. 26 N., R. 26 W., 5th P.M.  
Verona Quadrangle  
Lawrence County

Address: R.F.D. 2  
Verona, Missouri 65769

### Accessibility

The Rusha Farm lies about one mile east - southeast of Verona. The farm is about one-half mile south of U.S. Highway 60, on the south side of an east-west bituminous road.

### History Summary

During EPA's investigation of other Southwest Missouri dioxin sites, they received a lead that the Rusha Farm received some of the spent clay filter material from NEPACCO. This material was used to purify (decolorize) liquid hexachlorophene and supposedly was good for controlling "foot rot" in cattle. Anywhere from 10 to 28 drums of the filter material were spread on the feedlot. One drum, however, was leaking when it was brought to the farm; and was pushed out of the truck unopened. The filter material from this drum was still visible at the time of the EPA investigation and was sampled. The feedlot soil was found positive for 2,3,7,8-TCDD at 435 ppt, and the filter clay at 3,160 ppt. Mr. and Mrs. Rusha have been advised to stay away from the two areas until remedial action is taken.

### Site Description

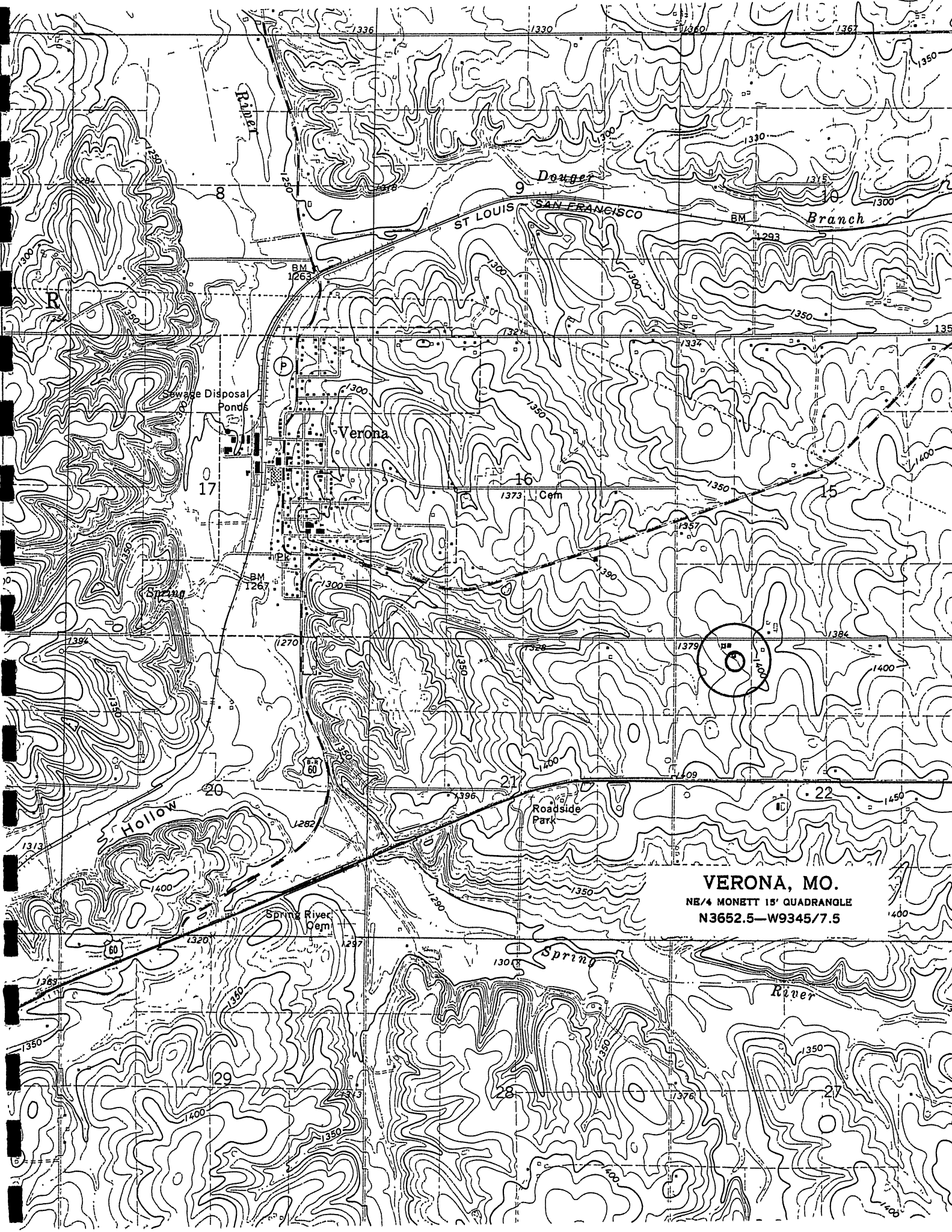
The filter material was spread next to a fence about 150 feet long in a 10 foot wide swath. The sample was a composite of four aliquots taken about 5 feet from the fence and 1 1/2 to 2 inches below the surface.

The single drum mentioned was the only remaining drum at the site. The site map shows the approximate location of the drum and feedlot, which is presently overgrown with weeds.

The Rusha well is 360 to 400 feet deep and 200 to 300 yards from the sites. No well samples were taken, as the possibility of contamination is next to impossible.

### Geologic and Soils Description

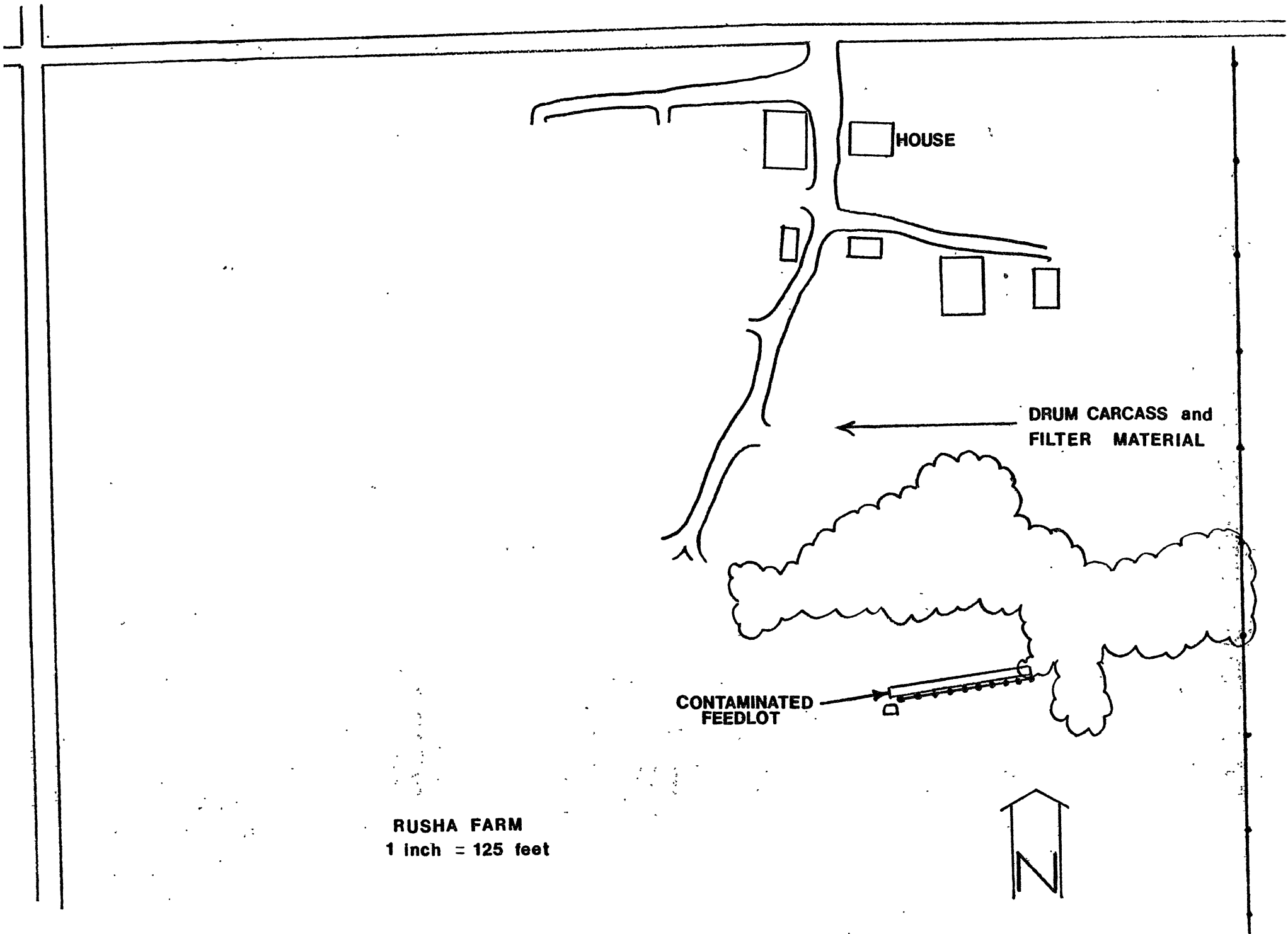
The Rusha Farm lies in the Spring River drainage basin. The Spring River study by USGS is nearing completion, and geologic information will be supplied then.



**VERONA, MO.**

NE/4 MONETT 15' QUADRANGLE

N3652.5—W9345/7.5



HOUSE

DRUM CARCASS and  
FILTER MATERIAL

CONTAMINATED  
FEEDLOT

RUSHA FARM  
1 inch = 125 feet



## SPRING RIVER

### Location

Legal Description: NE 1/4, Sec. 25, T. 26 N.,  
R. 26 W., 5th P.M.  
Aurora Quadrangle  
Lawrence County

The River flows westerly about 74 miles through Lawrence and Jasper Counties to the Oklahoma border. Then it turns southerly and ultimately flows into the Lake of the Cherokees.

### Accessibility

The River is bordered primarily by private agricultural land. There are several public access sites used for fishing and boat launching.

### History Summary

Water quality problems in the Spring River are documented back to 1961. Four nondischarging lagoons on the former Hoffman-Taft properties were the suspected source of contamination in the River. Some remedial measures were undertaken which apparently were partially successful. The water quality problems greatly intensified during NEPACCO's operation of the plant during 1970-71. During this period, bottom deposits and heavy algae growths were observed in the River and the branch east of the River that originates on the chemical plant property. Also in this branch, 6 to 8 inches of sludge was noted. The spring on the Erwin property at one point was reported to be black, containing no dissolved oxygen, and very odorous. A study by the Missouri Department of Conservation reported the river to be in an advanced state of organic pollution.

Due to the findings of the EPA investigation of NEPACCO and the Erwin Farm, it was decided to take fish samples because of the potential for dioxin entry in the food chain. Fish and sediment samples from the River showed positive for 2,3,7,8-TCDD. Cattle tissue samples from animals exposed to the River have been negative to date. Area hydrogeologic studies and additional fish sampling are being planned to determine if the contamination resulted from events that occurred during 1970-71 or from a continuing leachate problem.

## Site Description

The Spring River is a typical Ozark stream. It is classified as intermittent above U.S. Highway 60. Designated uses of the River are irrigation, livestock and wildlife watering, aquatic life, boating, body contact-recreation, and industrial purposes. Several species of fish are abundant in the River, and its popularity as a fishing stream provides substantial economic value to the local communities.

Following is a summary of 2,3,7,8-TCDD results in Spring River fish sampled in 1981-82:

Predators:	Average	Range
whole (2)*	4.3 ppt	2.5 - 6.2 ppt
fillet (4)	7.7	2 - 18
Bottom feeders:		
whole (7)	26	0.8 - 52
fillet (8)	18	2.5 - 40

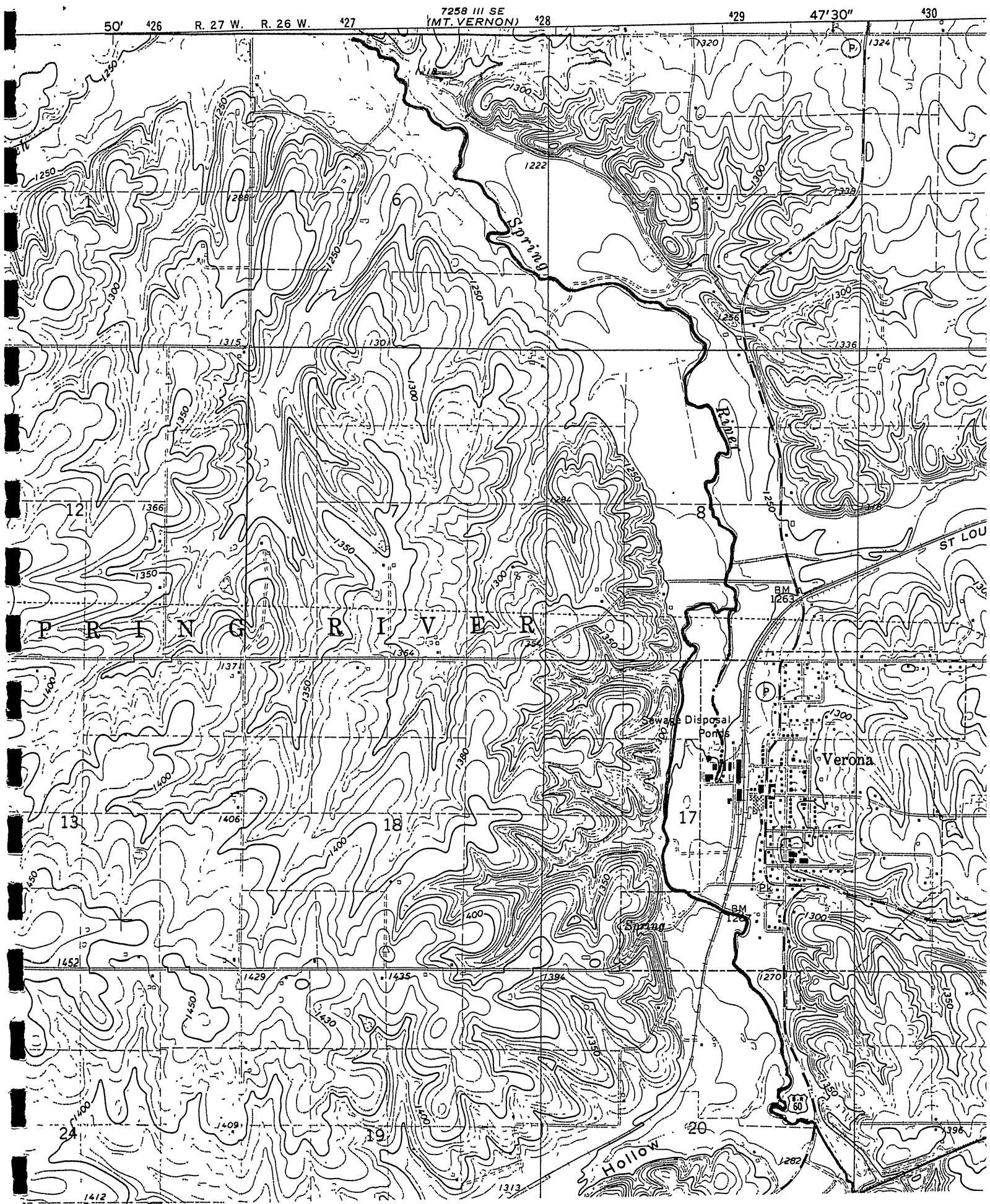
\*number of analyses

The furthest downstream that a positive sample was found was 0.8 ppt, 66 miles from Verona, or a few miles east of the Missouri-Oklahoma border. One sediment sample, taken 1/3 mile downstream from Verona, was positive at 12 ppt.

There is a standby well in Verona which could serve Verona and/or Aurora. The well is 1,100 feet deep. It could be assumed that some farms in the Spring River Basin have wells.

## Geologic and Soils Description

The River generally has a rocky gravel bottom with little apparent silt deposition in the upper reaches. The River is defined as gaining throughout its length. More information will be available as a result of the pending hydrogeologic study.





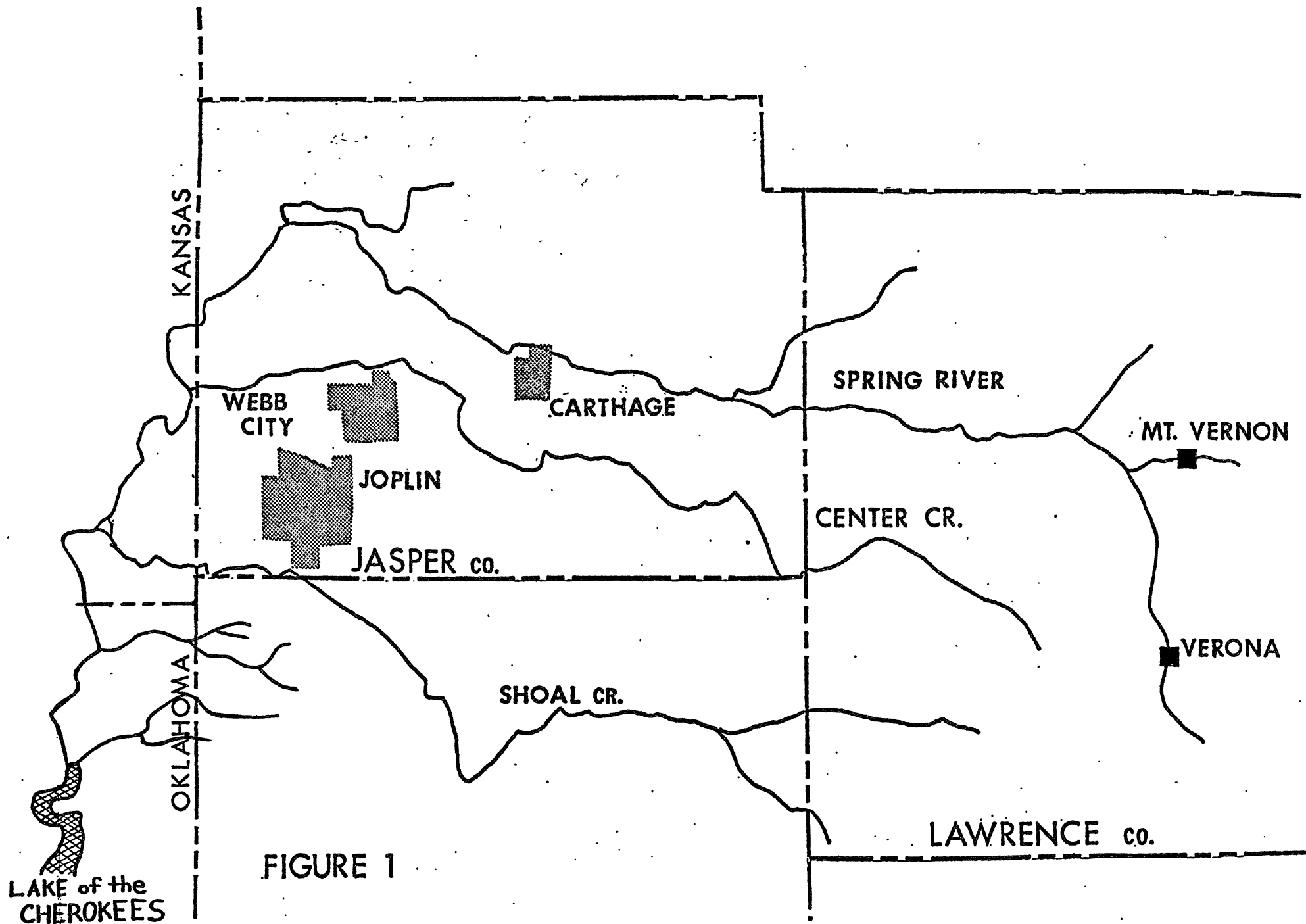


FIGURE 1

## SYNTEX FACILITY

### Location

Legal Description: SW 1/4, NE 1/4, and SE 1/4, NW 1/4  
and NE 1/4, SW 1/4, Sec. 17,  
T. 26 N., R. 26 W., 5th P.M.  
Verona Quadrangle  
Lawrence County

Address: Syntex Agribusiness, Inc.  
First Street  
Verona, Missouri 65769

### Accessibility

The plant lies on the western boundary of the Verona city limits. The trench and burn areas lie within the plant property boundaries, outside of the city limits.

### History Summary

The Syntex plant in Verona has a history of varying owners and operators. Hoffman-Taft, Inc. owned and operated the plant throughout the 1960's and produced components of Agent Orange during 1968-69. Northeastern Pharmaceutical and Chemical Company (NEPACCO) operated a portion of the plant from late 1969 until early 1972, during which time it produced hexachlorophene. Syntex discovered a tank of dioxin-laden still bottoms at the plant in 1974, apparently produced during NEPACCO's operation. After studying methods to destroy dioxin, Syntex destroyed most of the dioxin using the photolysis process. It was also believed that wastes resulting from previous operations were disposed of in several locations on the facility property now known as the trenches, the lagoon area, the burn area, and the NEPACCO irrigation area. These areas were subsequently sampled by Syntex and found positive for 2,3,7,8-TCDD.

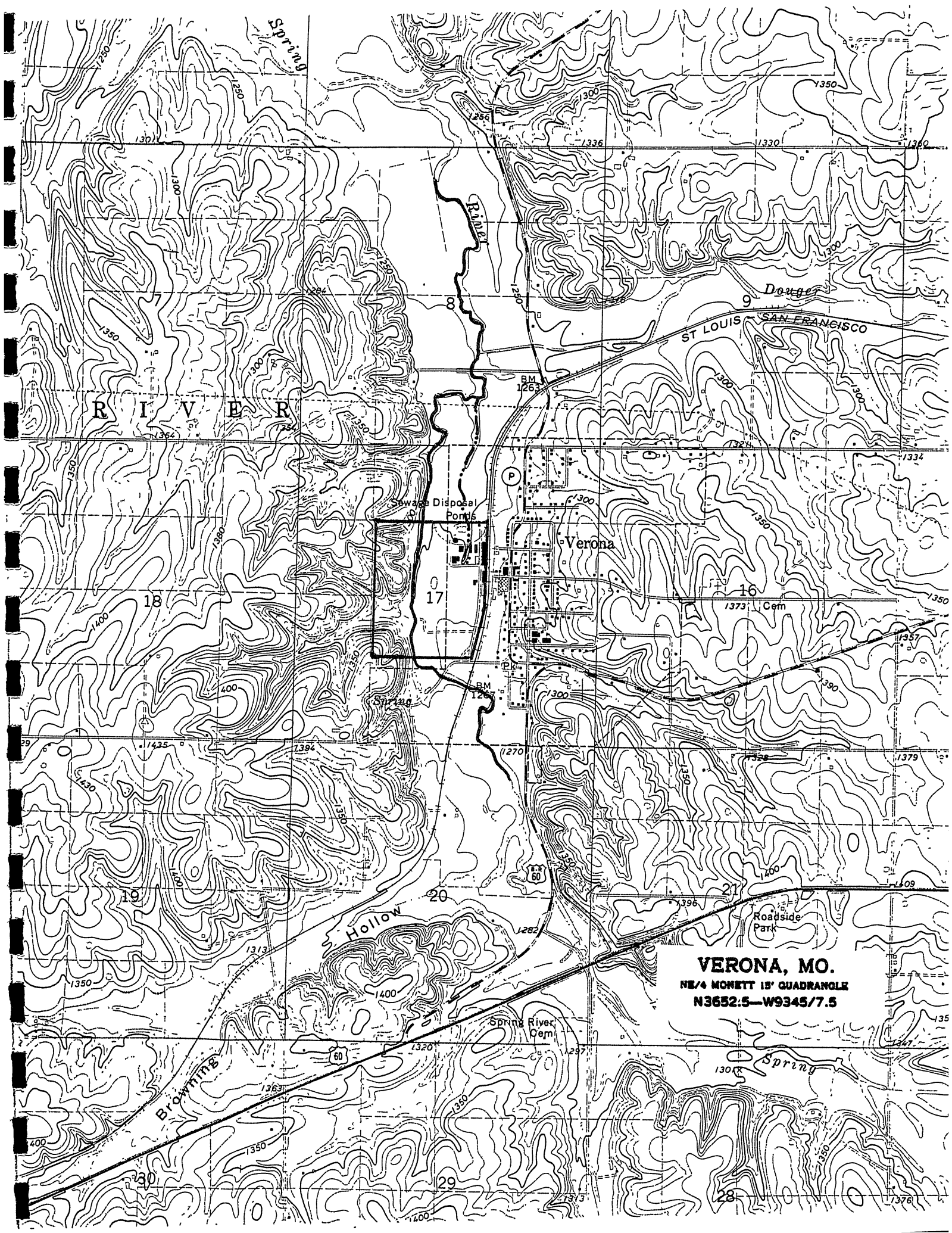
### Site Description

The Syntex Agribusiness, Inc. plant in Verona produces agricultural products such as vitamins, feed additives, and mold inhibitors. The Spring River flows northerly through the approximately 120 acre plant site. The four 2,3,7,8-TCDD contaminated areas are shown on the site map. The trench area was used to bury a variety of wastes. It was sampled to a depth of 12 feet, and 15 feet around the perimeter. Dioxin levels were found up to 69 ppb. The burn area was used from the early 1960's to the early 1970's to burn waste paper and other combustibles. It was sampled to a 3 foot depth, resulting in dioxin levels up to 24 ppb. The NEPACCO irrigation area was used for about 1 month in late 1971. It was sampled to a 1 foot depth, resulting in dioxin levels up to 29 ppb. The lagoon was used from 1966 to 1979 to evaporate liquid wastes, after which it was filled in with dirt. It was sampled to a 4 foot depth, resulting in dioxin levels up to 340 ppb. The majority of positive samples at the four areas range from 1 to 30 ppb.

The sampling did not indicate that dioxin-contaminated material is currently moving from these areas into the Spring River.

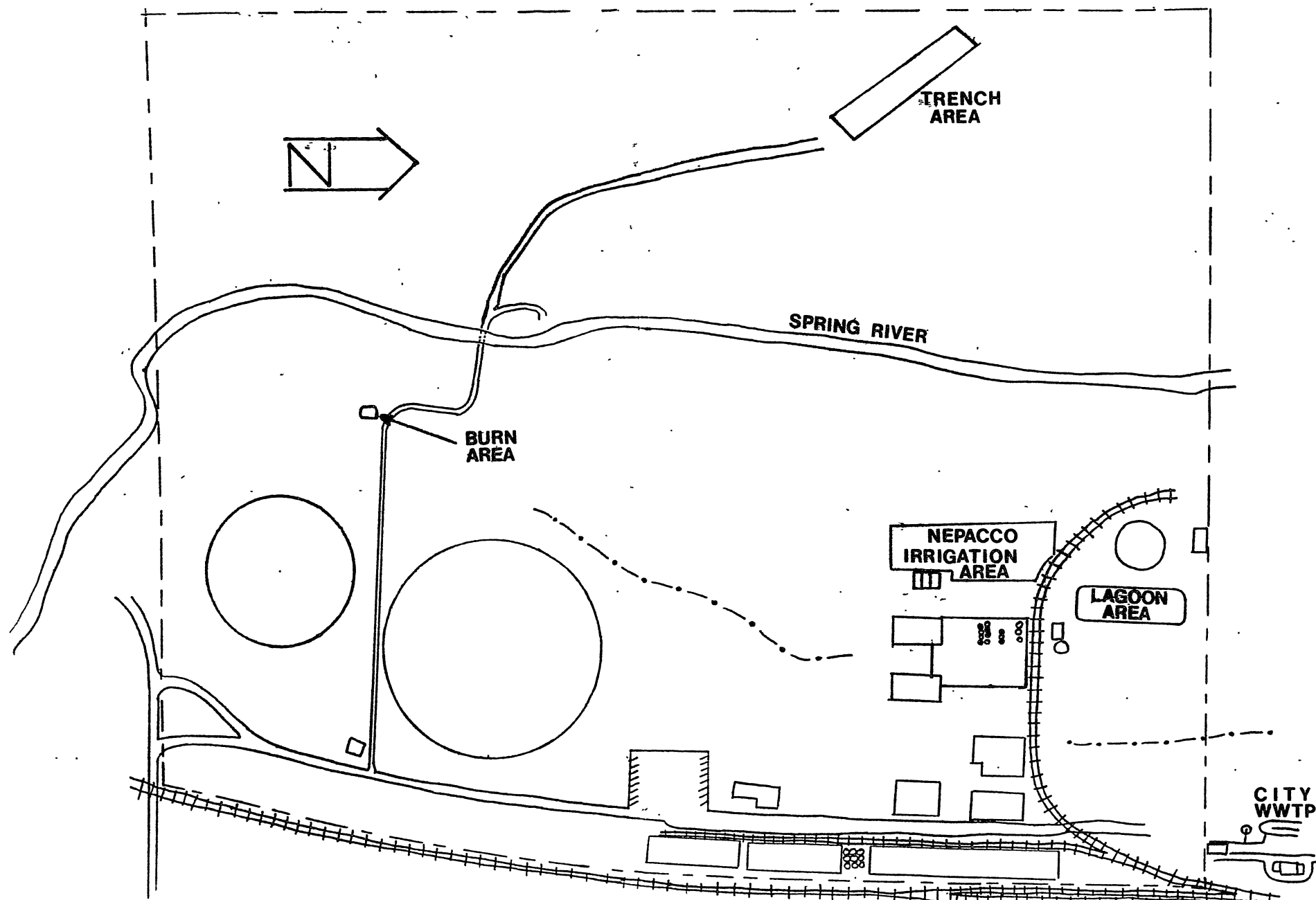
#### Geologic and Soils Description

The Spring River study by U.S.G.S. is nearing completion and geologic information will then be available.

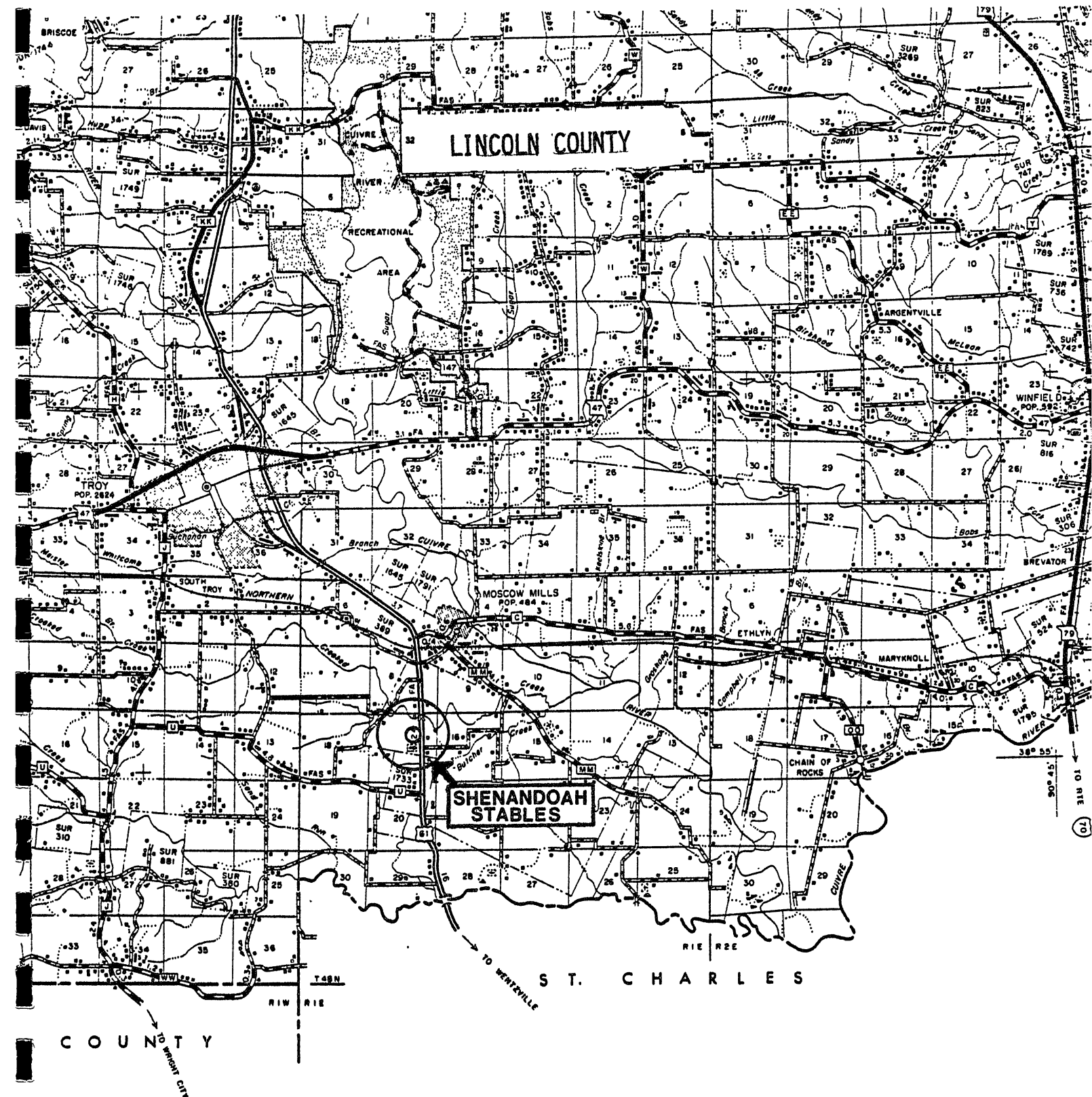


**VERONA, MO.**

NE 1/4 MONETT 15' QUADRANGLE  
N3652.5-W9345/7.5



**SYNTEX FACILITY**  
1 inch = 312 feet



## SHENANDOAH STABLES

### Location

Legal Description: NE 1/4, SW 1/4, NE 1/4, Sec. 17,  
T. 48N. R 1E., 5th P.M.  
Troy Quadrangle  
Lincoln County

Address: Rural Route 1  
Moscow Mills, Missouri 63362

### Accessibility

The stables are located along the west side of U.S. Highway 61, 1.3 miles south of Moscow Mills, or about 10 miles north of Interstate 70. The arena building sits about 200 feet off of the highway.

### History Summary

In May 1971, Bliss Oil Co. sprayed the Shenandoah Stables with what apparently was straight still bottoms liquid. From then on about 75 horses died or were destroyed. Soil was excavated from the arena twice. First, 6 to 8 inches of soil, approximately 350 cubic yards was removed and used as a very small part of the fill for the southbound lane of the new Highway 61. Reportedly, the soil was worked in and graded with the normal fill to bring the highway up to grade. Consequently, the contaminated material was diluted with clean fill and probably exists as lenses with varying concentrations at different depths. Later approximately 790 to 1,060 cubic yards (18 to 24 inches) of soil was removed and placed in a slough area immediately southeast of the stables. According to the co-owner at the time of the incident, the fill was about 2 feet deep and was covered with about 6 inches of clean soil and/or gravel. EPA and the owner have signed a consent order to close the arena.

### Site Description

The site has one large structure which houses the arena, bleachers, stables, and lounge area. There is a trailer northeast of the structure. All samples taken around the trailer, including vacuum dust, contained less than 1 ppb. Sample results from in the arena building are as follows:

Composite from middle of arena:

0-6"	75.0 ppb
6-12"	20.0
12-18"	12.0
18-24"	3.2
24-30"	1.4

Composite from perimeter of arena:

0-6"	127.0 ppb
6-12"	101.0
12-18"	101.0
18-24"	23.0
24-30"	14.3

Dust from spectator bleachers 110.0 ppb  
Dust from ceiling of lounge area 80.0

0-6" composite from slough area 113.0 ppb  
6-30" composite from slough area 1175.0

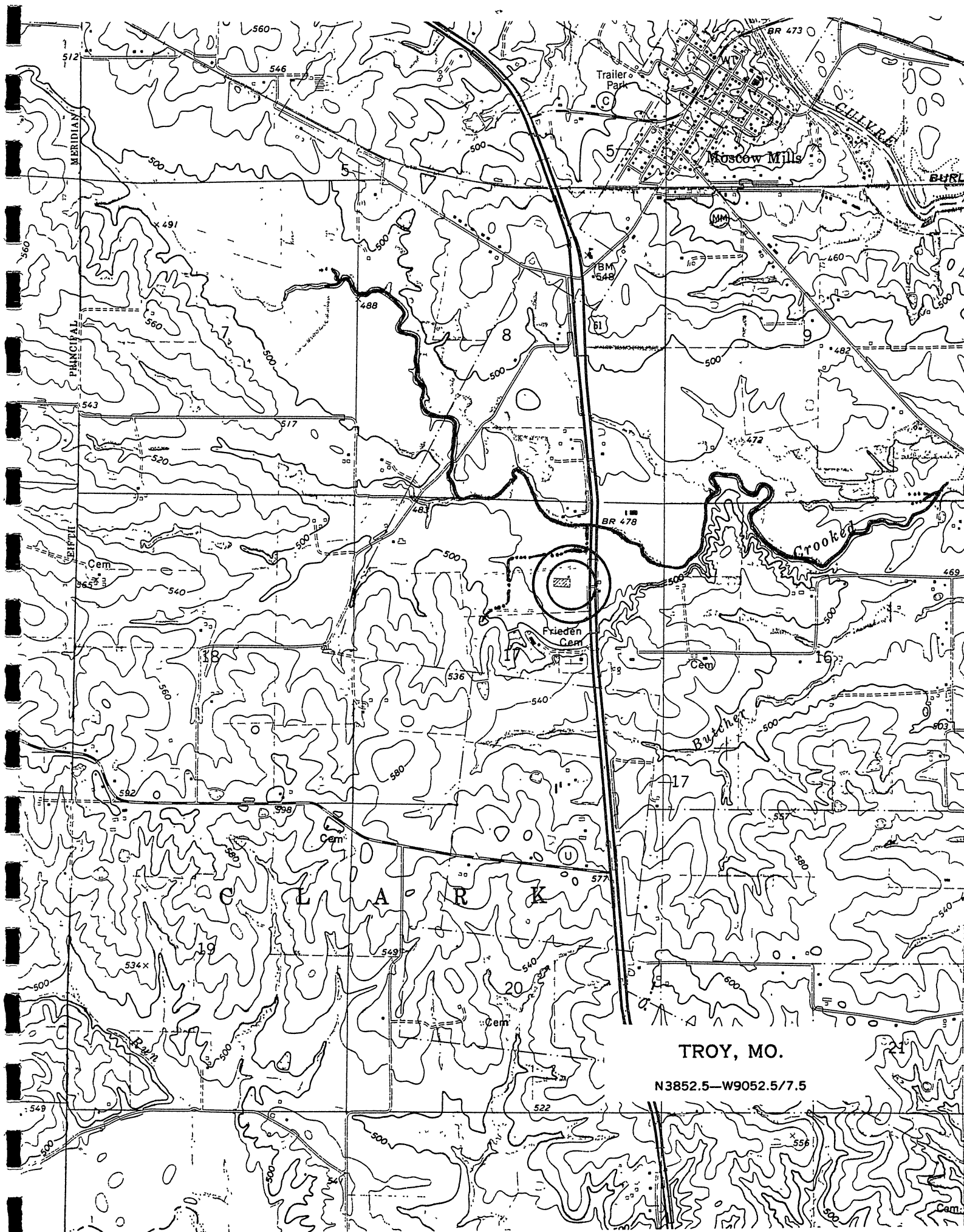
Three well samples from the area, including the well at the stables, were negative at a detection limit of 1 ppt. Samples of Crooked Creek sediments and 61 drainage ditch downstream of the site were uncontaminated at a detection limit of 0.03 ppb.

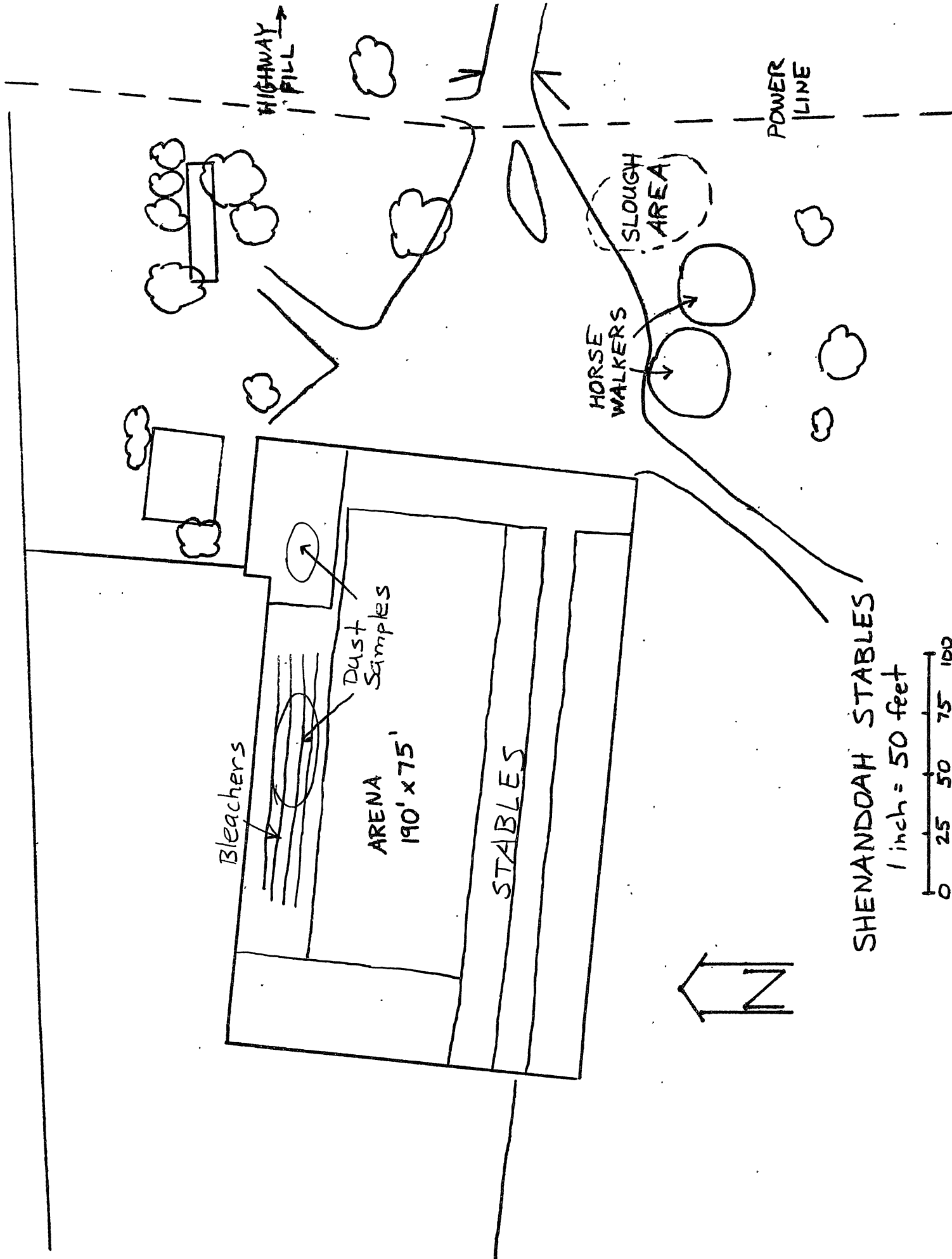
### Geologic and Soils Description

Shenandoah Stables sits on the floodplain of Crooked Creek, which is a gaining stream, downstream to its confluence with Cuivre River. Soil in the hillslopes adjacent to Crooked Creek in the vicinity of the site consists of a veneer of loess and modified loess over a thick but variable sequence of glacial till. Most of the till is high in clay content but sandy areas or pockets are not uncommon. The alluvium along Crooked Creek has laterally continuous deposits high in sand content, likely a mixture of silt, sand, and a little clay. The alluvium would be underlain by glacial till or Mississippian bedrock.

Although the alluvium would have low transmissivity, water infiltrating on the Shenandoah Stables could move slowly down the valley before entering Crooked Creek. However, substantial sediment transport would probably be prevented by the soil texture of sand, silt, and clay. The more likely means of sediment transport away from the site would be by erosion. The area is subject to flooding.

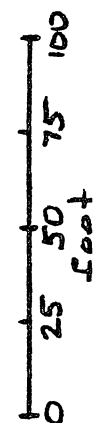


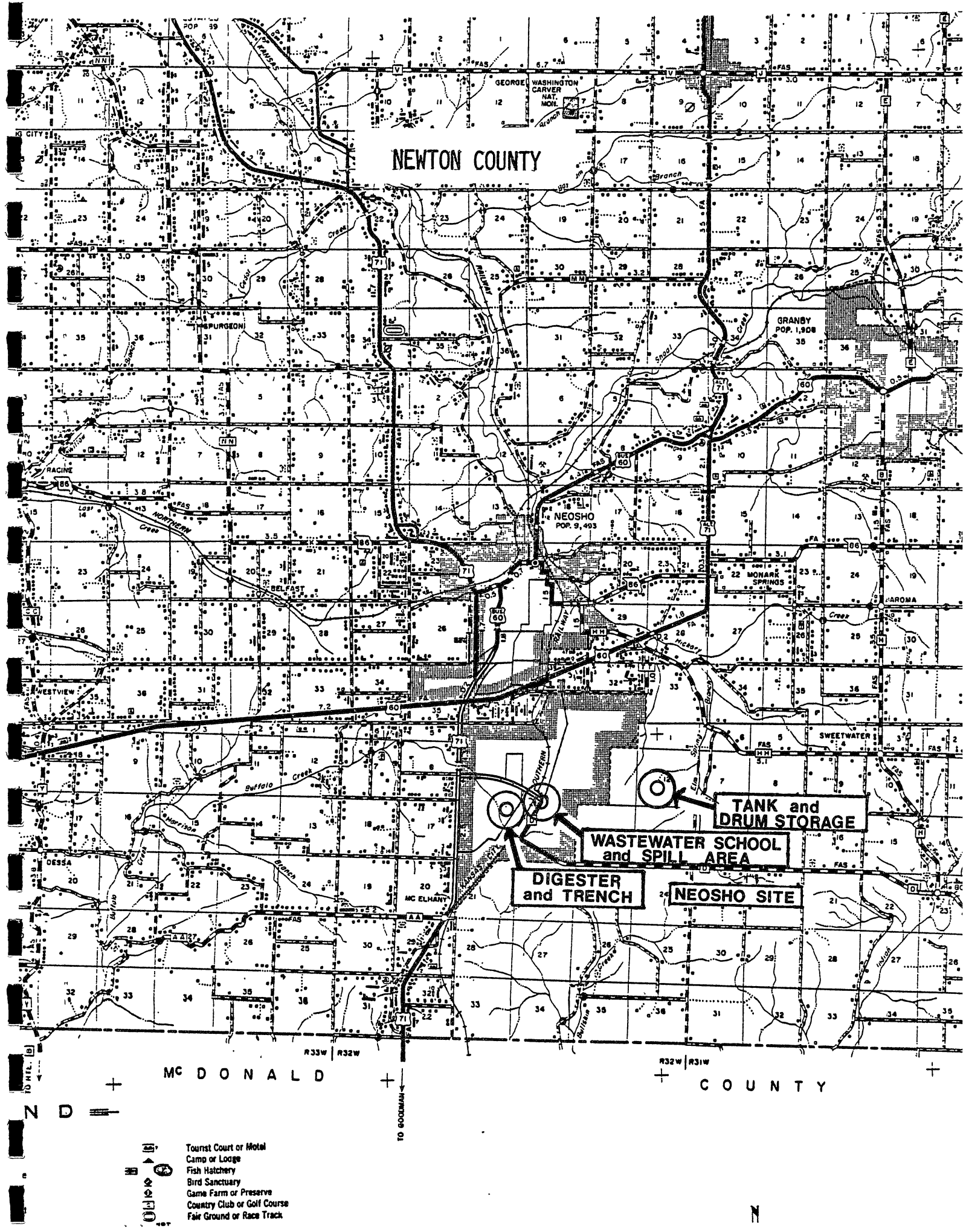




SHENANDOAH STABLES

1 inch = 50 feet





NEWTON COUNTY

NEOSHO  
POP. 9,493

GRANBY  
POP. 1,908

TANK and  
DRUM STORAGE

WASTEWATER SCHOOL  
and SPILL AREA

DIGESTER  
and TRENCH

NEOSHO SITE

MC DONALD

COUNTY

- Tourist Court or Motel
- Camp or Lodge
- Fish Hatchery
- Bird Sanctuary
- Game Farm or Preserve
- Country Club or Golf Course
- Fair Ground or Race Track



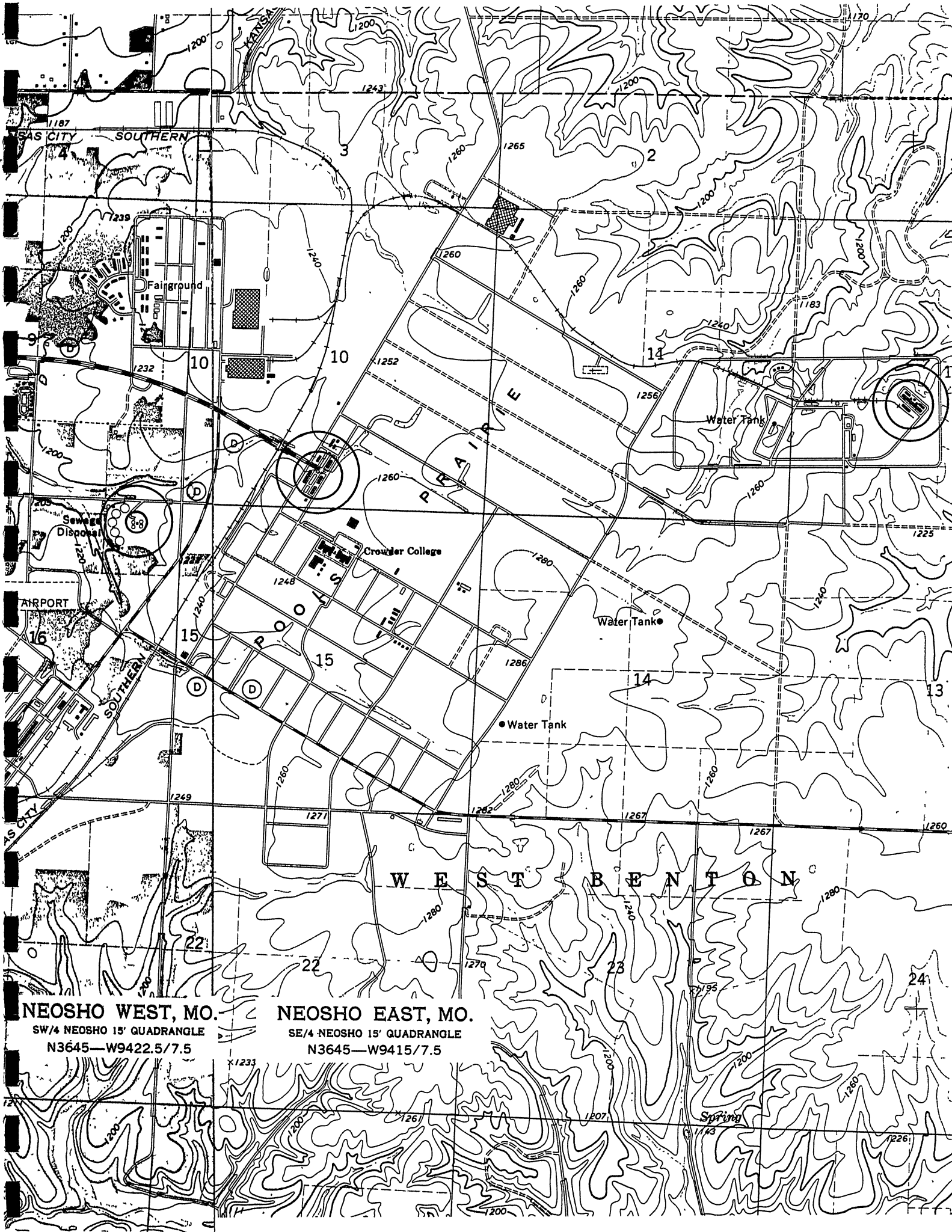
NEOSHO DIGESTER, TRENCH, TANK, SPILL  
AREA AND WASTEWATER SCHOOL

The City, School, and EPA are in the process of negotiating cleanup actions at this site. The site consists of the following:

An abandoned wastewater sludge digester containing contaminated soil, and adjacent trench.

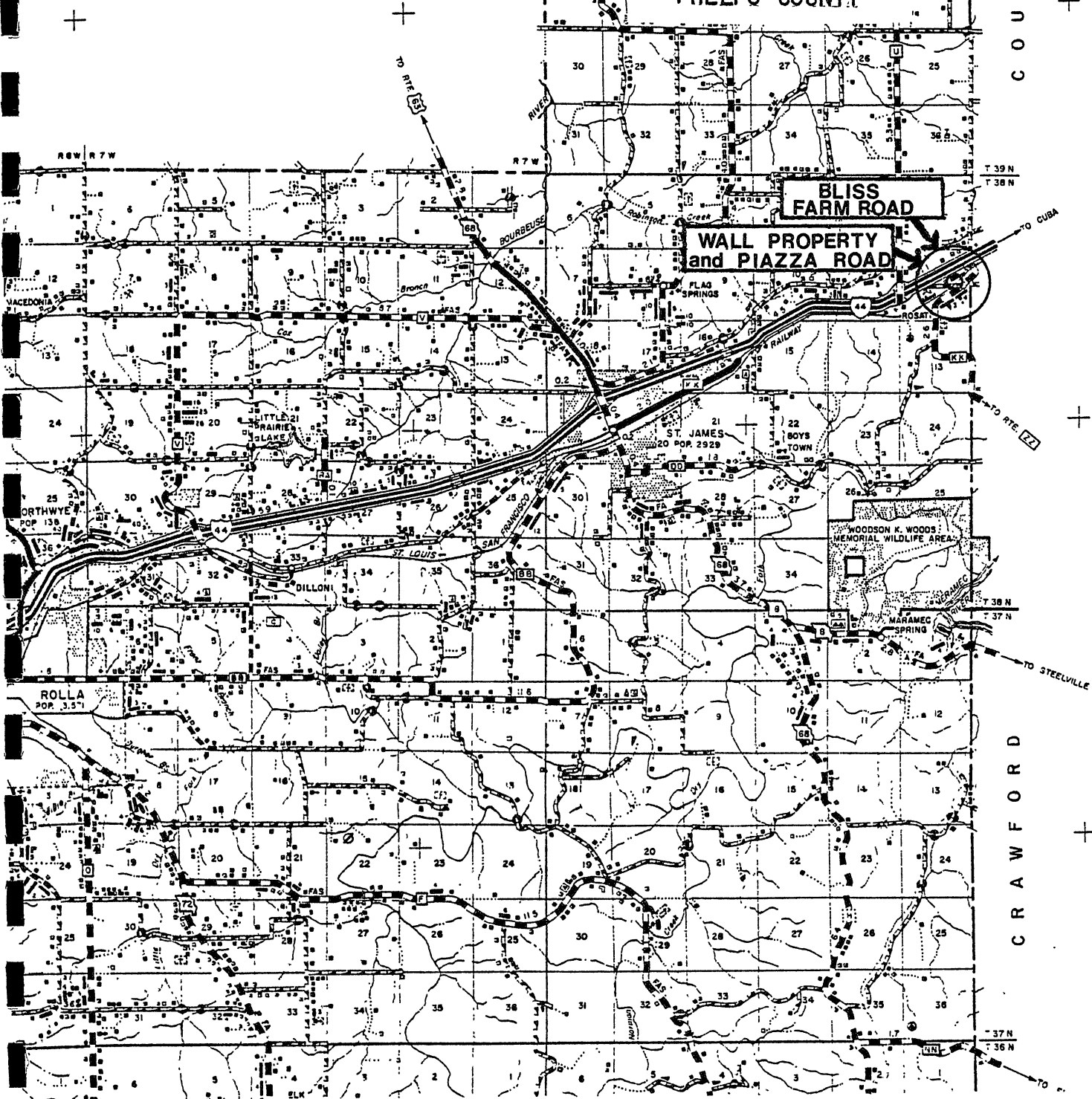
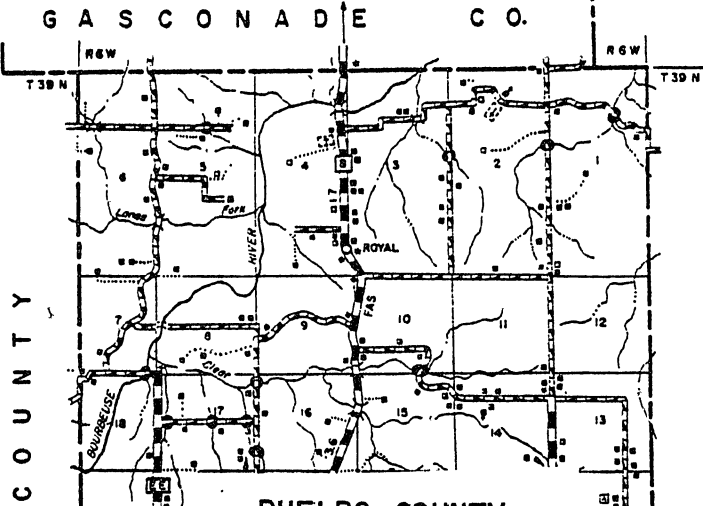
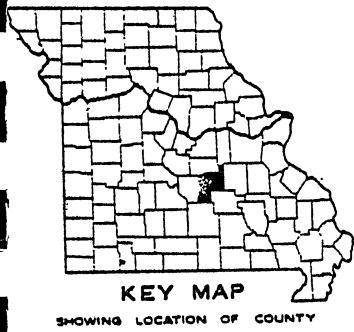
A tank that contains contaminated residue. The tank is securely confined and isolated in a metal building.

A spill area consisting of in-place contaminated soil.



NEOSHO WEST, MO.  
SW/4 NEOSHO 15' QUADRANGLE  
N3645—W9422.5/7.5

NEOSHO EAST, MO.  
SE/4 NEOSHO 15' QUADRANGLE  
N3645—W9415/7.5



BLISS FARM ROAD  
WALL PROPERTY AND PIAZZA ROAD

Location

Legal Description: E 1/2, Sec. 12, T. 38 N.,  
R. 6 W., 5th P.M.  
Rosati Quadrangle  
Phelps County

Address: Route 3  
St. James, Missouri

Accessibility

Piazza Road runs between Route KK and the Interstate 44 service road about 5 miles east of St. James, just west of the town of Rosati.

History Summary

The roads at this site were sprayed by Bliss Oil Co. several times during the 1970's. These were the Bliss farm road at the eastern end of Piazza Road, and Piazza Road for a distance of about 1000 feet eastward from Route KK. The road was reportedly oiled so heavily that it was being tracked into houses. In May, 1982 initial sampling found 388 ppb in the Bliss farm road and 0.3 ppb in the horse arena on the Bliss property. After investigators learned that Piazza Road was oiled, it was sampled in January, 1983 and 2,3,7,8-TCDD was found up to 980 ppb along the shoulder. Additional sampling was done in April, 1983.

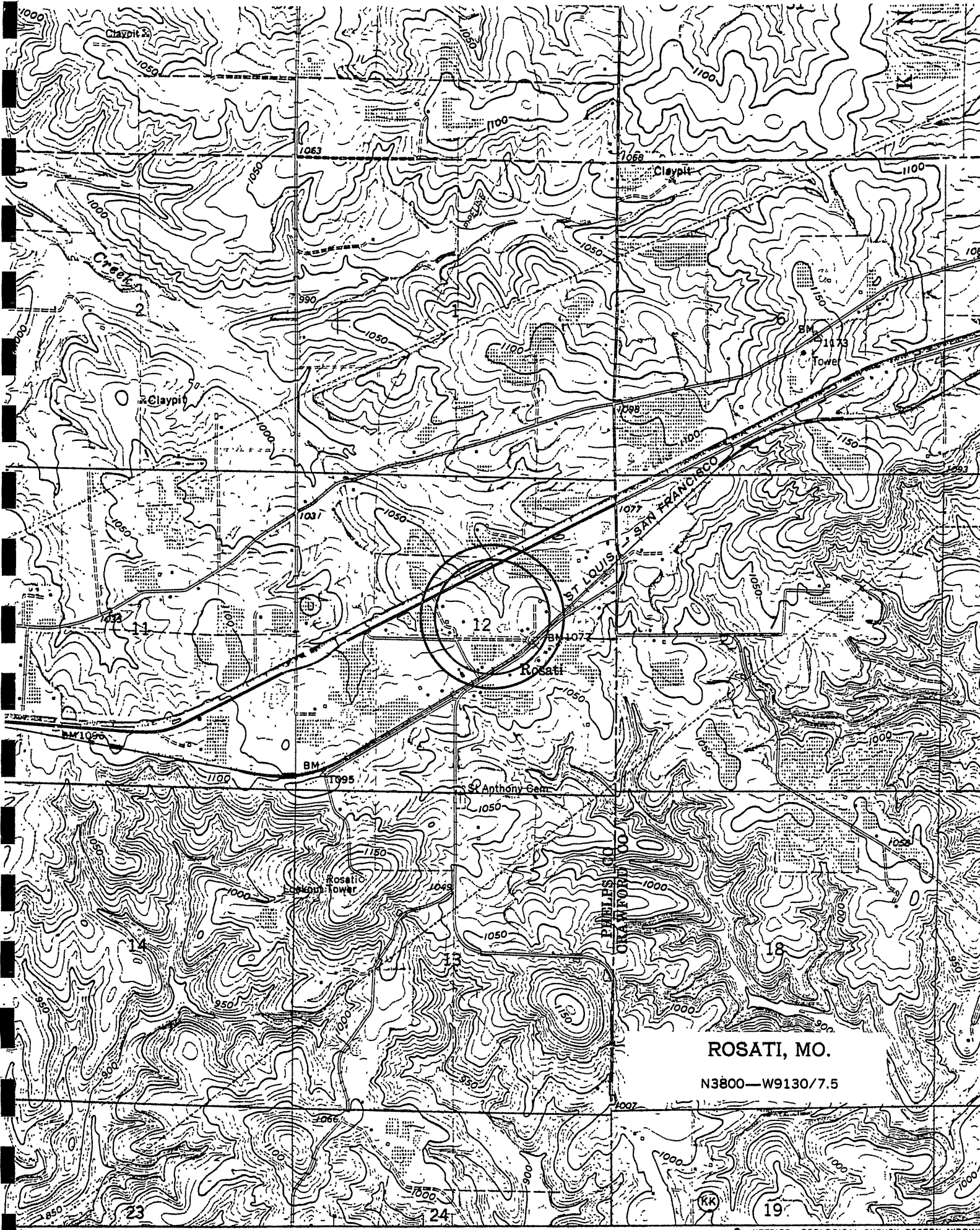
Site Description (See Map)

The length of oiled road at these sites is about 500 feet of the Bliss farm road and about 1000 feet of Piazza Road. Contamination in the shoulder of Piazza Road has been found to 36", the greatest depth sampled. The most recent sampling found 1800 ppb in Piazza Road near the surface. 2,3,7,8-TCDD was found in one driveway at 80 ppb, and in two yards at up to 4 ppb. The site generally drains to the north, and contamination was found in sediment samples taken from the drainage area on the Bliss property.

Geologic and Soils Description

Not available.





ROSATI, MO.

N3800—W9130/7.5

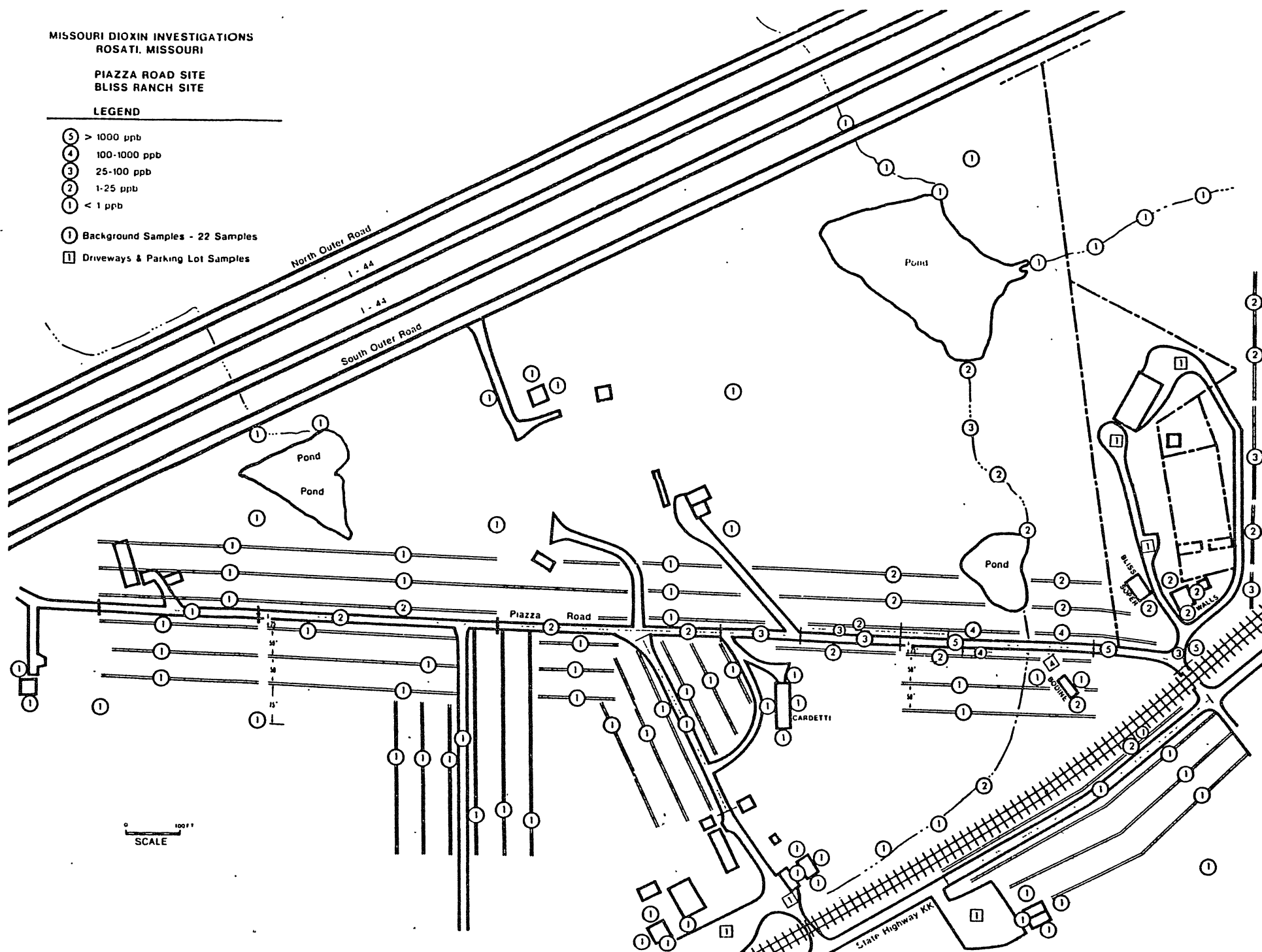


MISSOURI DIOXIN INVESTIGATIONS  
ROSATI, MISSOURI

PIAZZA ROAD SITE  
BLISS RANCH SITE

LEGEND

- (5) > 1000 ppb
- (4) 100-1000 ppb
- (3) 25-100 ppb
- (2) 1-25 ppb
- (1) < 1 ppb
- (1) Background Samples - 22 Samples
- (II) Driveways & Parking Lot Samples





## HAMILL TRANSFER COMPANY

### Location

Legal Description: St. Louis City  
Granite City and Cahokia Quadrangles  
Latitude: 38° 37' 30"  
Longitude: 90° 13' 51"

Address: 900 Virginia Avenue  
St. Louis, Missouri 63103

### Accessibility

The site sits northwest of the intersection of Virginia and Chouteau Avenues.

### History Summary

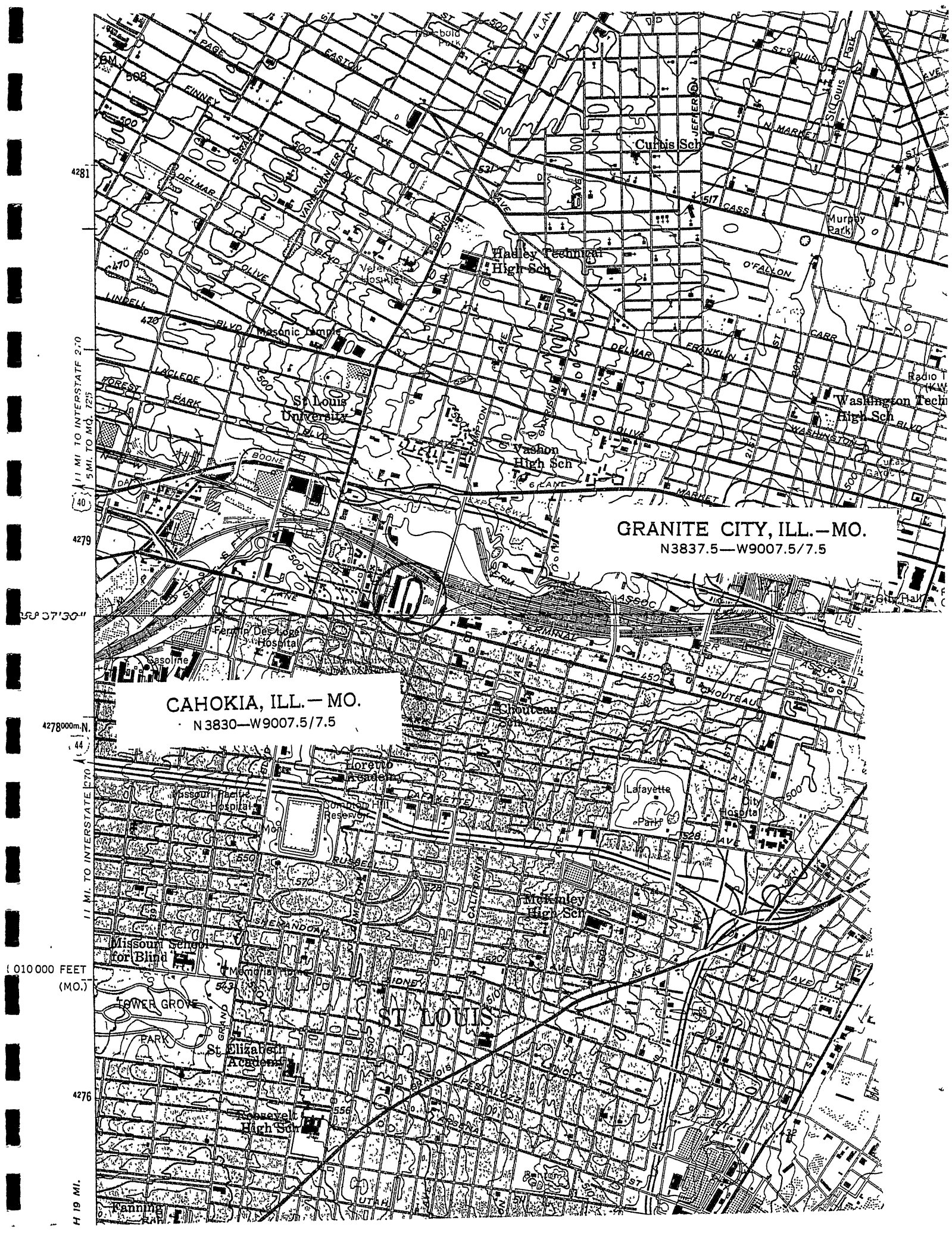
According to company records, Bliss oiled the driveway, bay and parking areas at this site with 8,000 gallons of waste oil in May, 1972. In 1979, the truck yard was sprayed with hot tar and covered with 3 to 5 inches of gravel. Since then, potholes have been routinely filled in with gravel. EPA screening sampling was done in December, 1982. These showed 2,3,7,8-TCDD up to 15.6 ppb near the surface. Followup sampling was done in February 1983.

### Site Description (see maps)

The site covers about 2.8 acres. The main structure spans the entire width of the lot, and divides the lot from front to back. It is bordered by a railway to the north, commercial lots on the east and west, and Chouteau Avenue to the south. The second sampling effort took several dust and dirt sampling from the building. Eight dust samples from various locations were negative at 1 ppb. Nine samples of floor dirt from several locations were negative at 2.5 ppb. Three potholes sampled were also negative at 1 ppb. Samples from 0 to 6 inches in the parking area showed levels up to 155 ppb. Samples from 6 to 12 inches had levels up to 29 ppb, and from 12 to 24 inches up to 6.7 ppb. All samples below 24 inches were negative.

### Geologic and Soils Description

Not available.



GRANITE CITY, ILL.-MO.  
N3837.5—W9007.5/7.5

CAHOKIA, ILL.-MO.  
N 3830—W9007.5/7.5

ST LOUIS

4281

11 MI. TO INTERSTATE 270  
5 MI. TO MO. 125

4279

37°30"

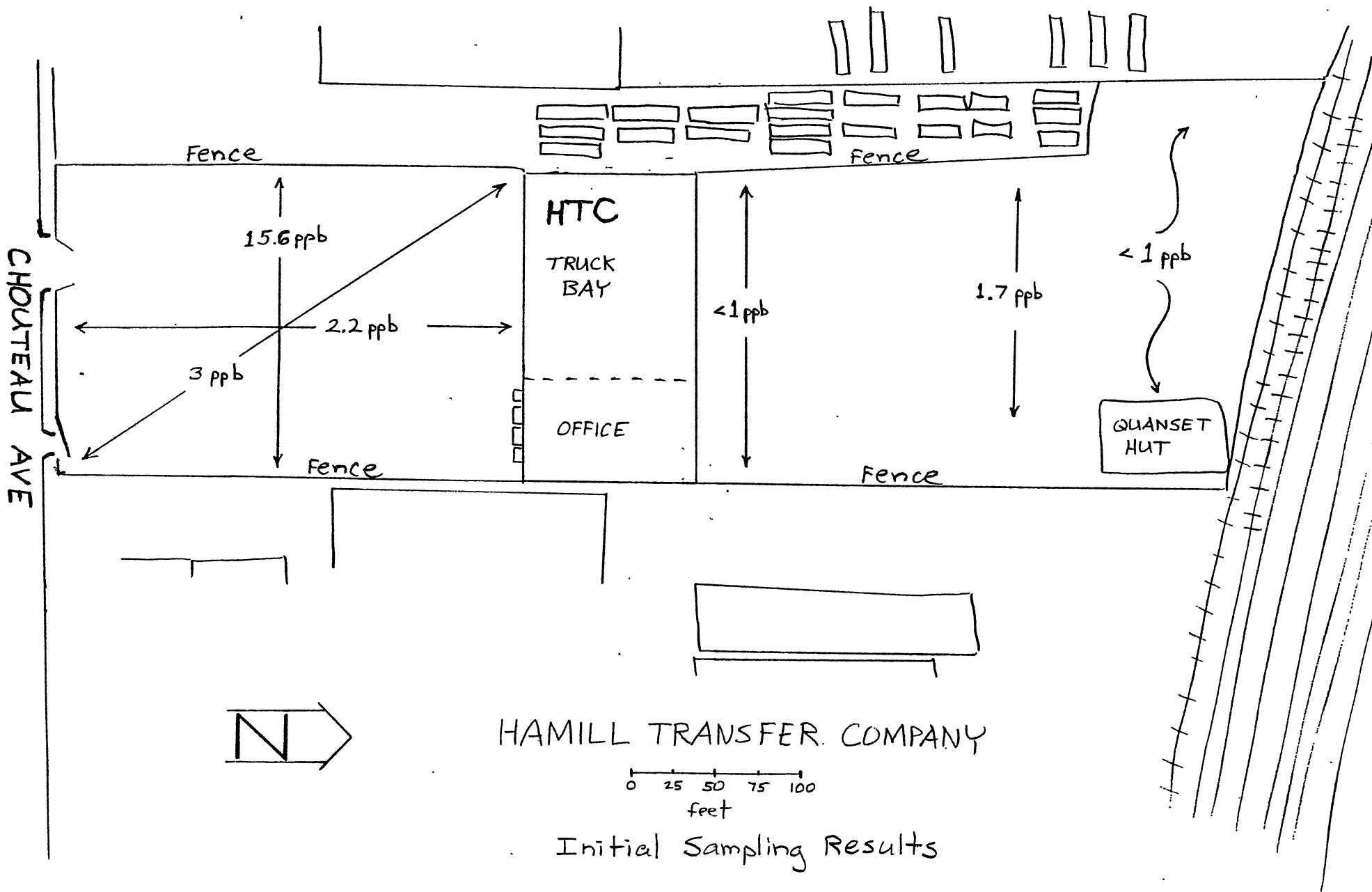
4278000m.N.

11 MI. TO INTERSTATE 270

1010000 FEET  
(MO.)

4276

H 19 MI.



## JONES TRUCK LINE

### Location

Legal Description: St. Louis City  
Granite City Quadrangle  
Latitude: 38° 41' 03"  
Longitude: 90° 12' 26"

Address: 5601 Hall Street  
St. Louis, Missouri

### Accessibility

The site can be reached by exiting Interstate 70 East at the Adelaide exit. Jones Truck Line is on the west side of Hall Street in the first block north from Adelaide.

### History Summary

The site was allegedly sprayed by Bliss Waste Oil Service in the early 1970's. A small amount of excavation has subsequently occurred. In 1974 the front half of the lot was paved, and in 1978, the rest of the lot was paved except for about 2% of the total area. In 1982, the scale pit was repaired and cleaned out. EPA screening sampling was conducted in December 1982, resulting in 2,3,7,8-TCDD contamination at levels from 2.9 ppb to 22 ppb.

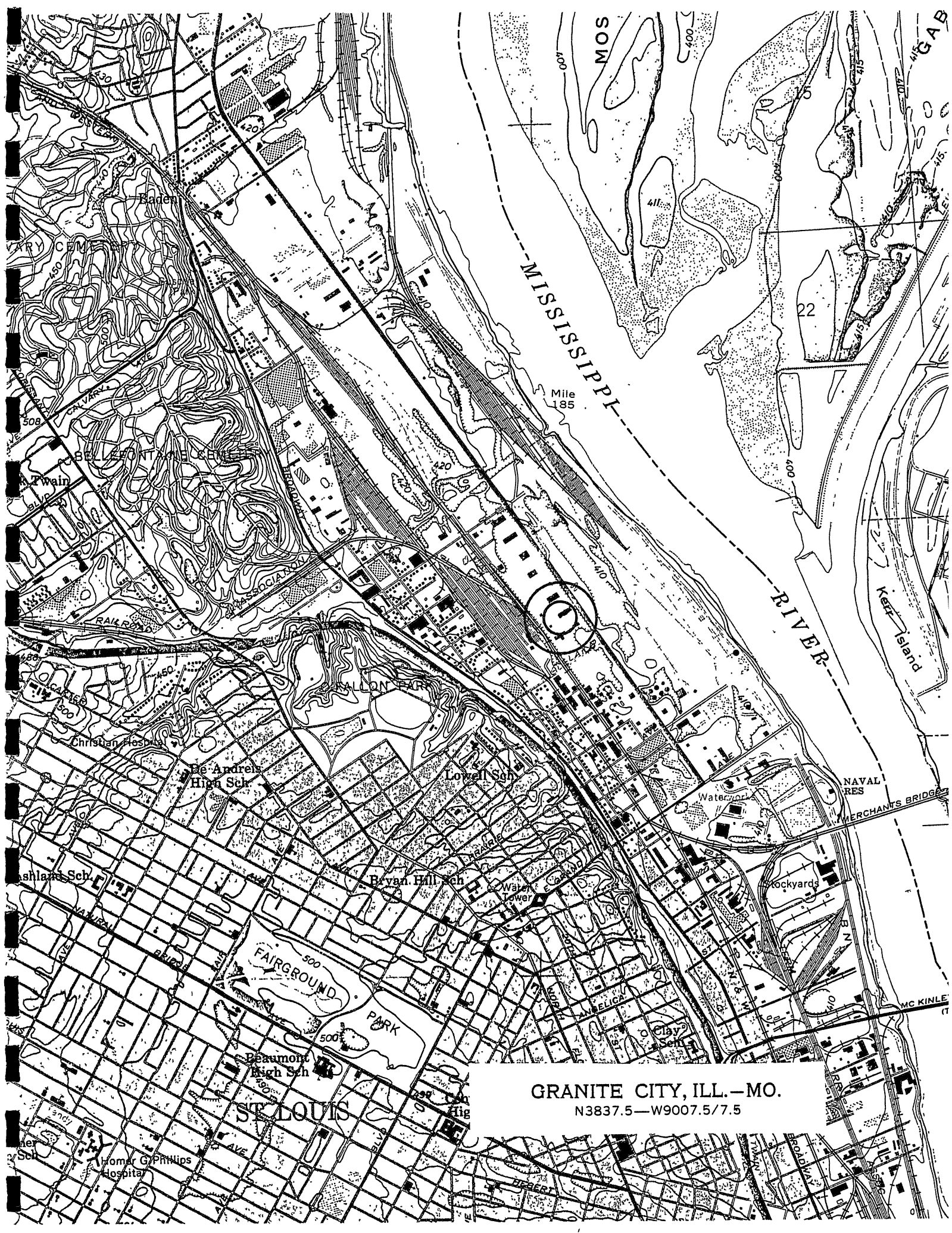
### Site Description (See Map)

The 4.5 acre truck terminal is surrounded by other truck terminals and bordered on the rear by a railroad yard, where most of the surface runoff goes. The terminal has about 40 office employees and 30 to 35 transient workers per day. The samples shown on the site map were collected below the asphalt surface. Follow-up sampling concluded that some dust on the rafters of the dock area is contaminated. Most of the area comprising Jones Truck Line was a sanitary landfill from 1953 to about 1965.

### Geologic and Soils Description

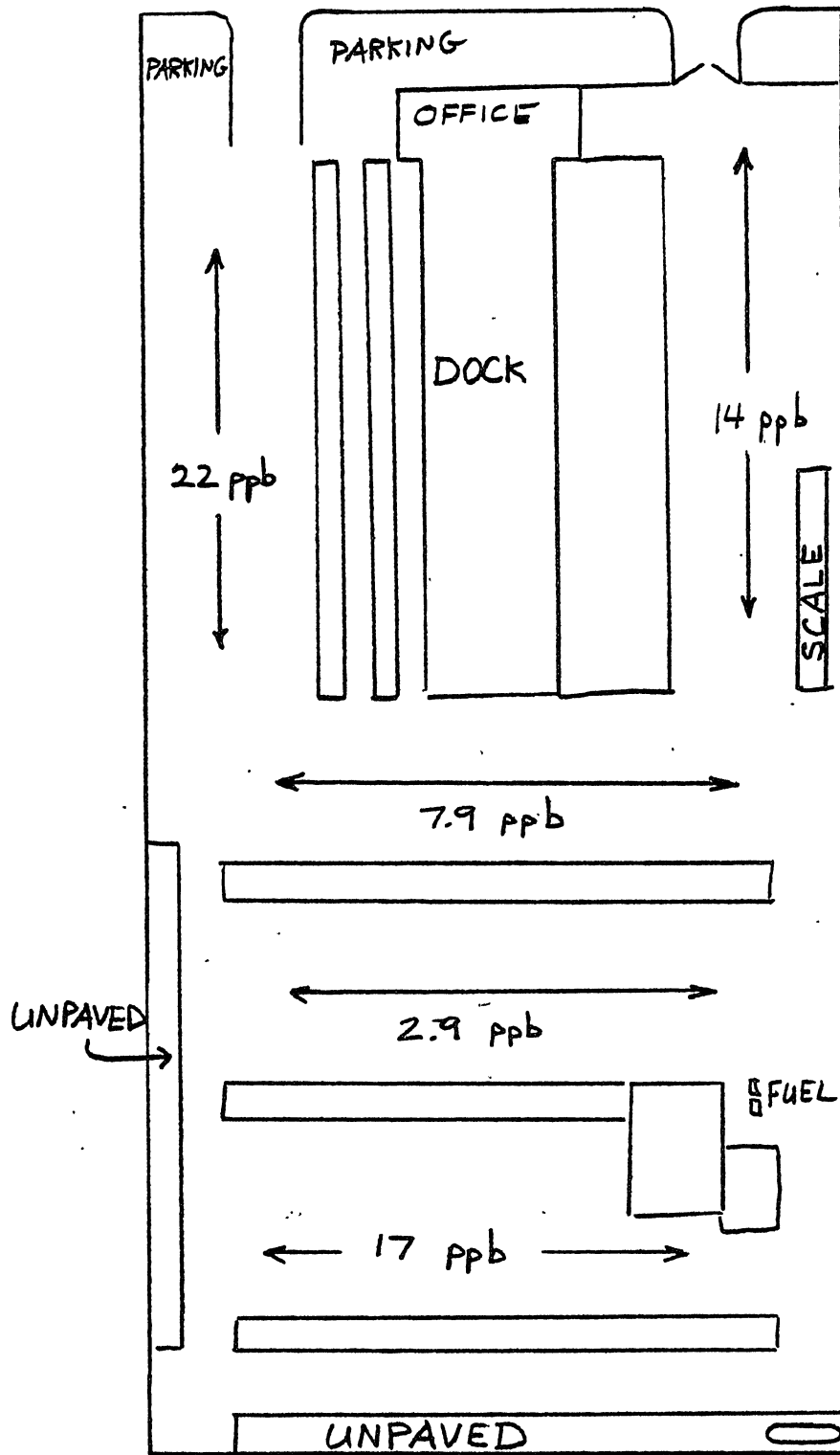
Not available.



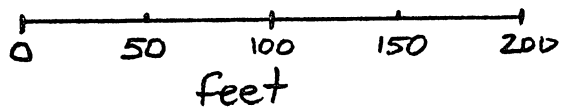


GRANITE CITY, ILL.-MO.  
N3837.5—W9007.5/7.5

HALL STREET



JONES TRUCK LINE





## OVERNITE TRANSFER, INC.

### Location

Legal Description: St. Louis City  
Granite City Quadrangle  
Latitude: 38° 42' 05"  
Longitude: 90° 13' 26"

Address: 7455 Hall Street  
St. Louis, Missouri

### Accessibility

The trucking company is located off of the Adelaide exit of Interstate 70, on the west side of Hall Street.

### History Summary

The Bliss Oil Company oiled this truck terminal lot during the 1960's and 1970's. The oiled area was subsequently asphalted. The Overnite Transfer Company acquired the property in 1981, and requested that it be sampled. The screening sampling showed 2,3,7,8-TCDD levels from less than 1 ppb to 9.2 ppb. Intensive sampling was done in February 1983.

### Site Description

The 10 acre truck terminal employs about 100 people. It is bordered on the south by another truck terminal, and on the north by the city demolition landfill. Railroad tracks border the rear of the property. The lot at the site consists of concrete and asphalt, or tar and gravel. The second round of samples consisted of 18 samples of dust and dirt scrapings from the dock area and surface scrapings from outside of the building. All were negative at a detection limit of 1 or 2.5 ppb.

### Geologic and Soils Description

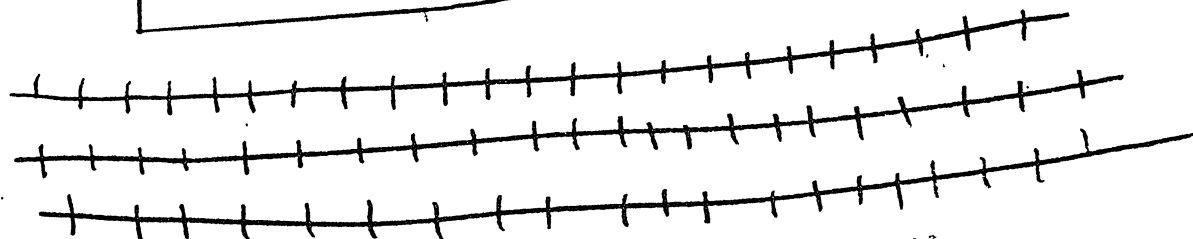
The site is on alluvial type soils consisting primarily of silts with some sands. Much of the Hall Street area has been filled with demolition debris. It appears that the site sits on natural ground, but the dump area boundaries are not detailed. Bedrock is limestone and shale. Groundwater moves toward the River and is of poor quality due to industrial development. The groundwater level is composed primarily by the level of the Mississippi River.



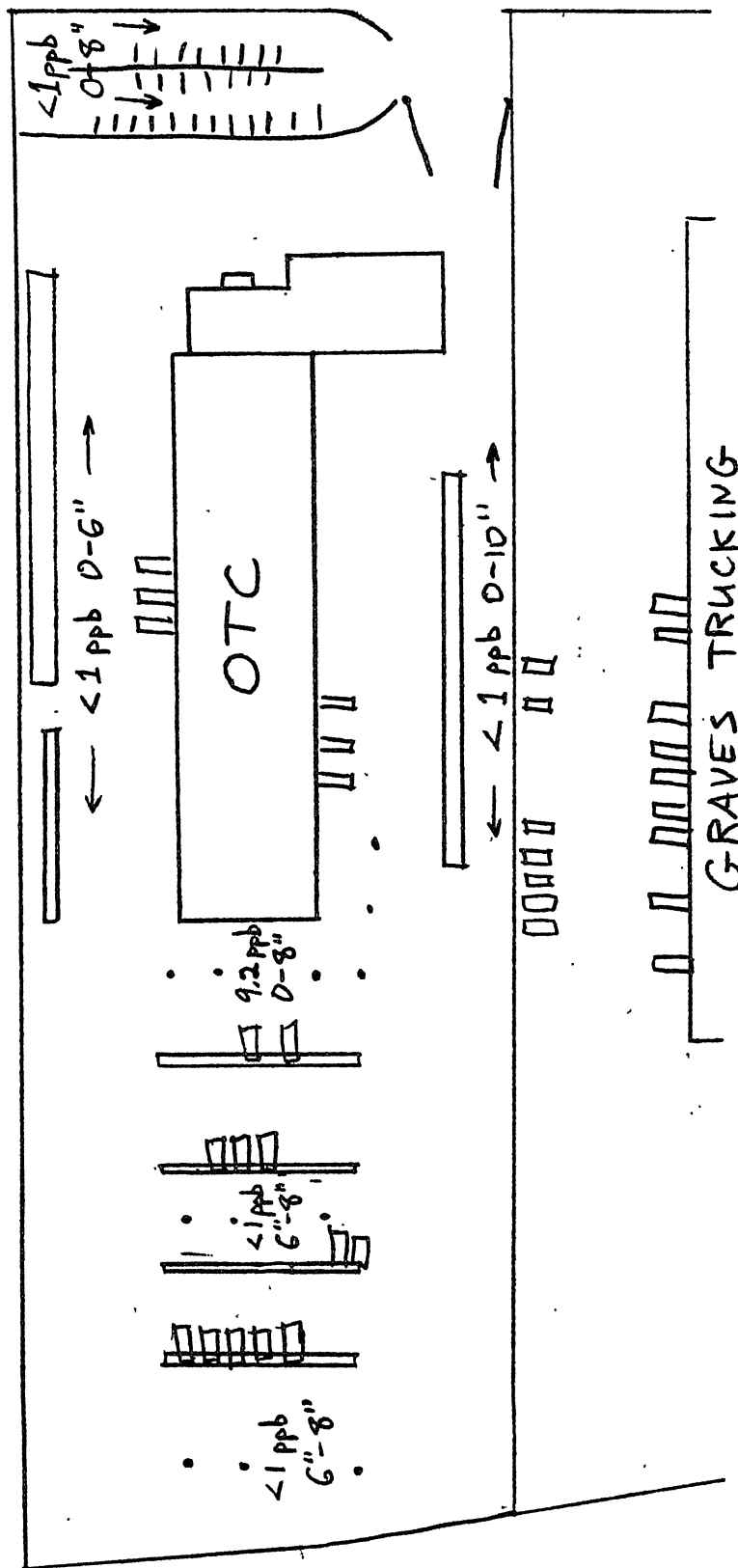
4289  
4288  
42'30"  
4287  
12 MI. TO INTERSTATE 270  
7961 III NE  
3.5 MI. TO U.S. 40 (CLAYTON)  
70  
730 000 FEET  
(ILL.)  
40'  
4283

GRANITE CITY, ILL.—MO.  
N3837.5—W9007.5/7.5

DEMOLITION  
LANDFILL

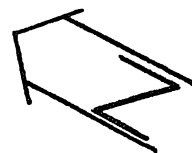
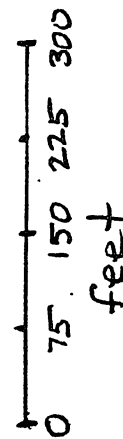


HALL STREET



GRAVES TRUCKING

OVERNITE TRANSPORTATION COMPANY





SOUTHERN CROSS  
LUMBER CO.

ST. LOUIS COUNTY

BAXTER GARDEN  
CENTER

BLISS OIL CO.

MID-AMERICA  
ARENA

METHODIST  
CHURCH

COMMUNITY  
CHRISTIAN CHURCH

SONTAG ROAD

TIMES BEACH  
CITY LIMITS

## BAXTER GARDEN CENTER

### Location

Legal Description: NW 1/4, Sec. 7,  
T. 45 N., R. 4 E., 5th P.M.  
Chesterfield Quadrangle  
St. Louis County

Address: 17259 Wild Horse Creek Road  
Chesterfield, Missouri 63017

### Accessibility

The site sits about 0.1 mile east of the junction of Kehrs Mill Road and Wild Horse Creek Road, on the north side of Wild Horse Creek Road. The site is fenced and there is very little public access.

### History Summary

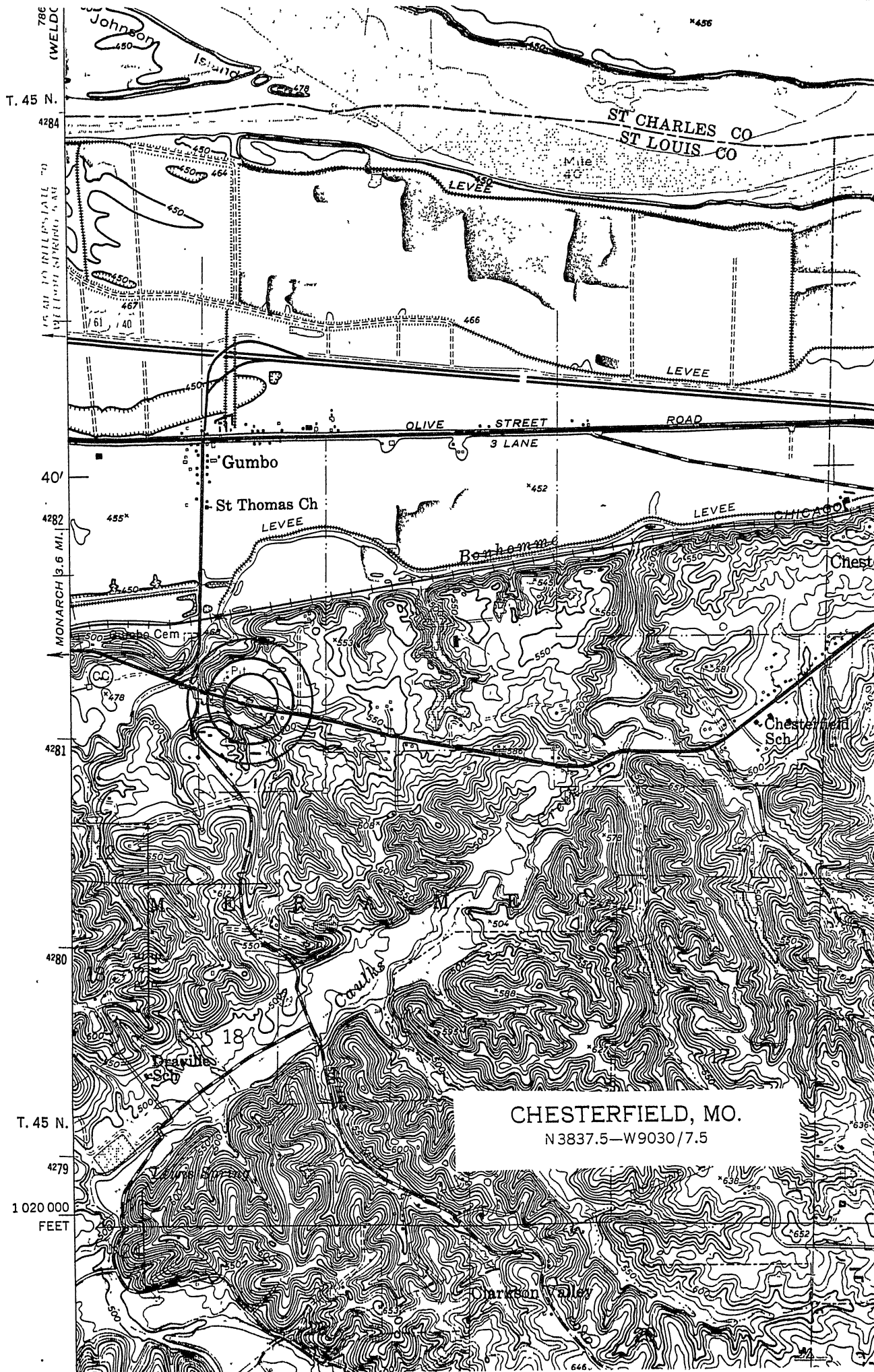
This site was oiled by Bliss Oil Co. in 1971. 2,3,7,8-TCDD was detected during EPA sampling in the spring of 1983. The property owner proposed to asphalt the area in order to keep in operation.

### Site Description (See Map)

The 2.2 acre Garden Center is a commercial nursery that stores balled trees, shrubs, and decorative stone. Buildings on the property include an office building and shed, and a greenhouse. The roadways throughout the area are contaminated in the range of 1.3 to 85 ppb at varying depths down to 14". The nearest residence is located 200 feet southeast of the site on the south side of Wild Horse Creek Road.

### Geologic and Soils Description

The site sits near a ridge top. The soil is a relatively homogeneous wind-blown deposit of silt modified through weathering to a silt-silty clay soil. This surface soil is fairly thick, and sits on limestone bedrock which is probably permeable due to solutionizing. The surface soil would prevent contaminated particles from being carried into the subsurface; however, the potential for erosion is good. The adjacent Bonhomme Creek and its tributary appear to be gaining. Contaminants leaving the site could potentially enter this tributary south of the site.

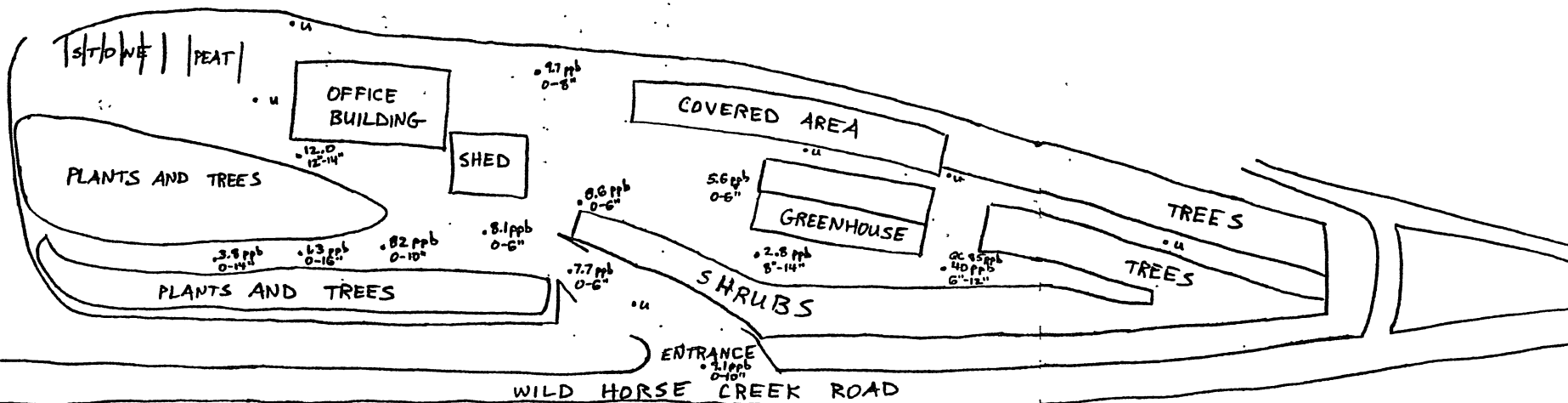


CHESTERFIELD, MO.  
N3837.5-W9030/7.5



SAND AND  
SOIL STOCKPILES

FIELD



BAXTER GARDEN CENTER

0 25 50 75 100  
feet

u=less than  
detection limit



## COMMUNITY CHRISITAN CHURCH

### Location

Legal Descirption: W 1/2, NW 1/4, Sec. 6,  
T. 44 N., R. 5 E., 5th P.M.  
Manchester Quadrangle  
St. Louis County

Address: 623 Meramec Station Road  
Manchester, Missouri

### Accessibility

The site is located about 1/2 mile south of Missouri Highway 100 in Manchester, on Meramec Station Road (Missouri Highway 141).

### History Summary

Bliss Oil Company apparently donated the oil and sprayed the roads and parking lot on the site. The oiled area was paved around 1980-81. EPA sampled the site in Summer, 1983.

### Site Description

2,3,7,8-TCDD was found at the following locations:

Drainage ditch	.58-7.7 ppb	0-6 inches
Parking lot	2-9.2 ppb	0-12 inches

Negative samples were obtained from the baseball diamond, gravel parking lot, dust from the church, and a soil pile on the property.

### Geologic and Soils Description

Not available.



# MANCHESTER QUADRANGLE

MISSOURI

7.5 MINUTE SERIES (TOPOGRAPHIC)

7961 III NW  
(CREVE COEUR)

32°30'

490 000 FEET

716

(141)

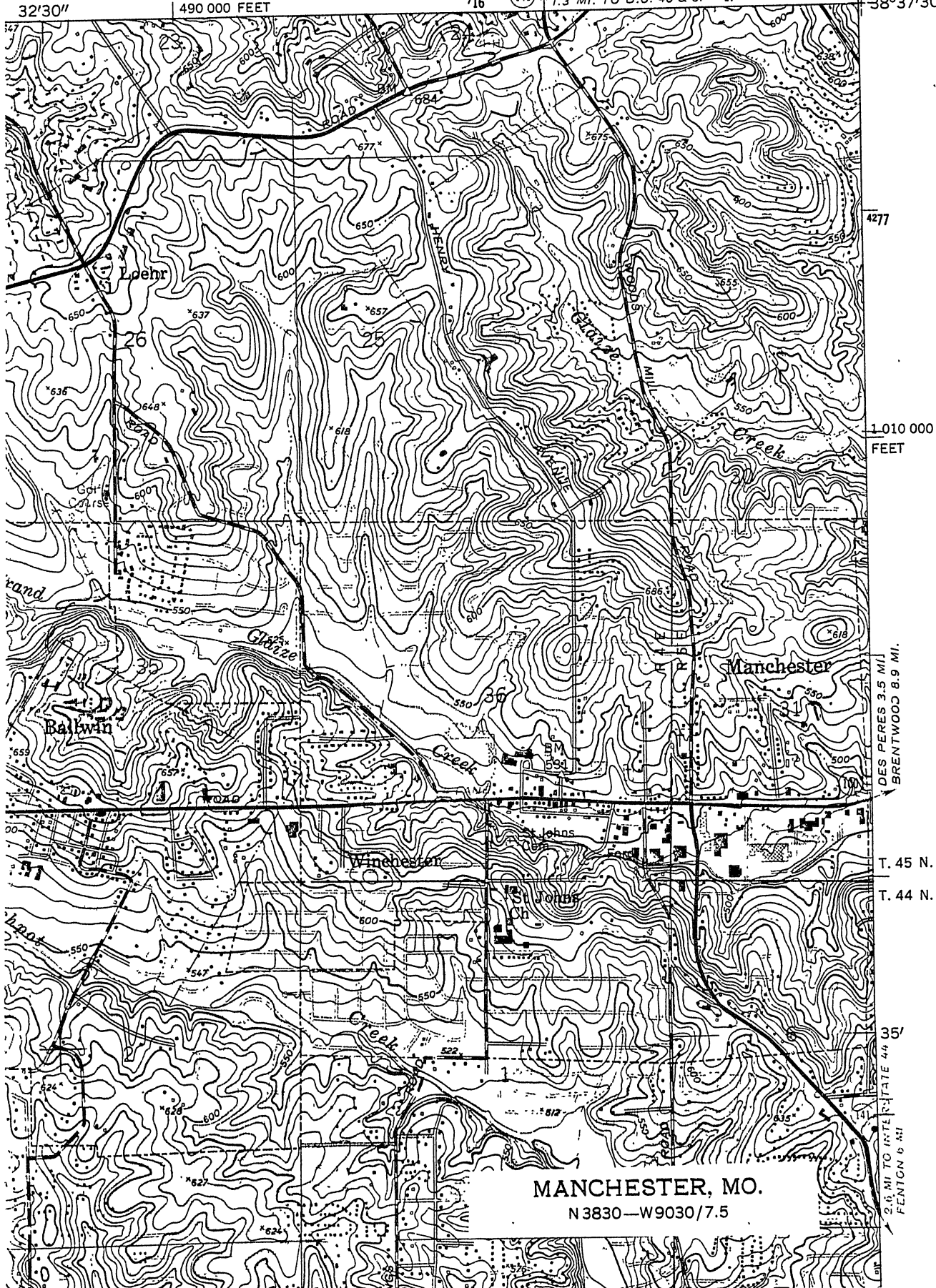
4 MI. TO MO. 340

1.3 MI. TO U.S. 40 & 61

717

90°30'

38°37'30"



1 010 000  
FEET

DES PERES 3.5 MI  
BRENTWOOD 8.9 MI.

T. 45 N.

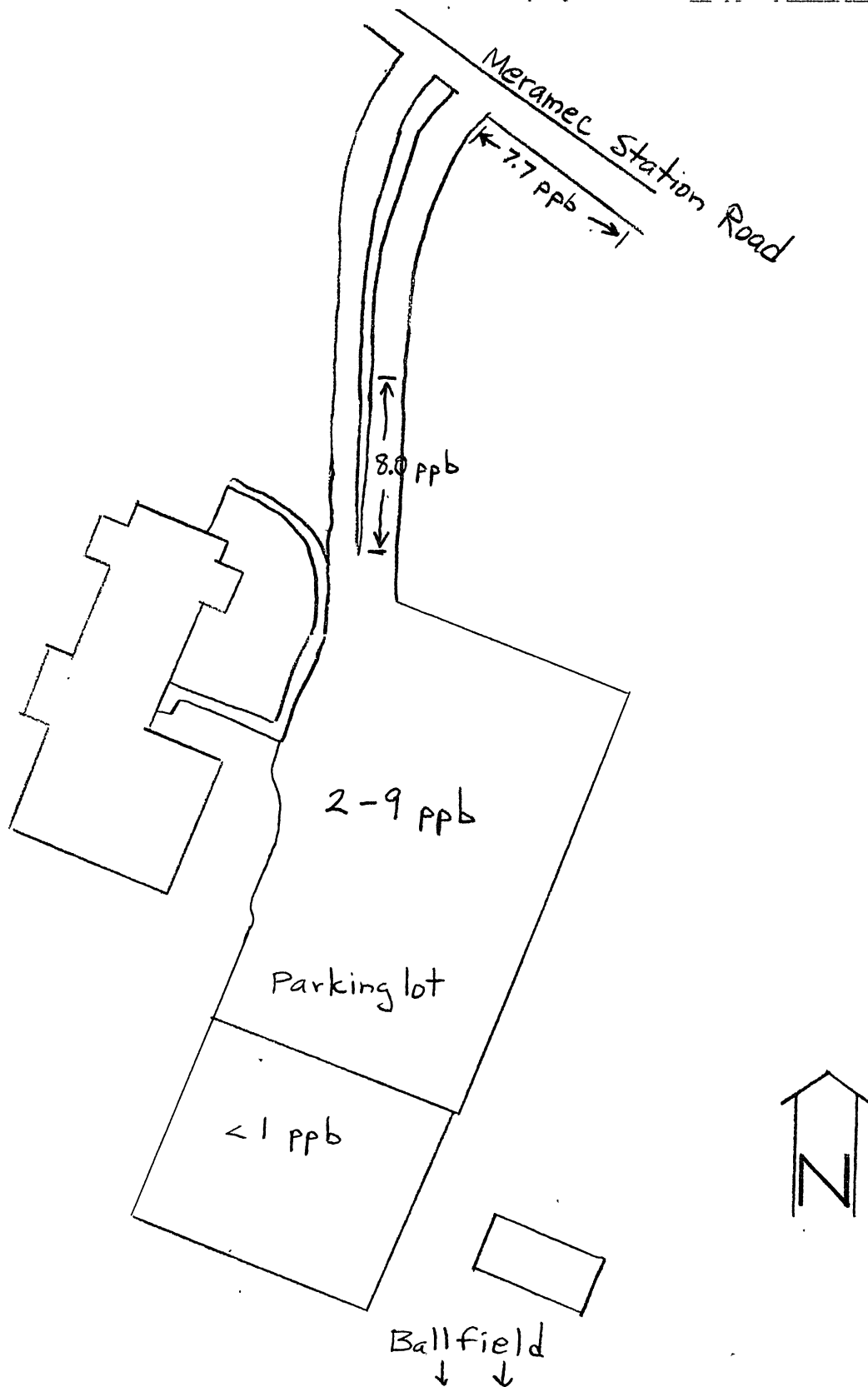
T. 44 N.

35'

2.4 MI. TO INTL. STATE 44  
FENTON 6 MI.

MANCHESTER, MO.

N 3830—W 9030/7.5



COMMUNITY CHRISTIAN CHURCH

0 100 200  
feet

## METHODIST CHURCH

### Location

Legal Description: SW 1/4, NW 1/4, SW 1/4, Sec. 31,  
T. 45 N., R. 5 E., 5th P.M.  
Manchester Quadrangle  
St. Louis County

Address: 129 Woodsmill Road  
Manchester, Missouri 63011

### Accessibility

The Methodist Church site is located on the west side of Woods Mill Road (Missouri Highway 141), about 1 block north of its junction with Manchester Road (Highway 100).

### History Summary

Bliss Oil Co. oiled the driveway or apparently a portion of the driveway around 1970. Soon after, the road was covered with 4 inches of gravel and paved. Screening sampling was conducted in December 1982, without penetrating any paved surface. Two samples were positive. Intensive sampling in February 1983 found only 1 additional positive sample.

### Site Description (See Map)

The church sits in a residential area. The driveway and parking lot are completely paved. The two positive samples found in the initial sampling were found at the edge of the driveway and down gradient in the drainage pathway. The follow up sampling covered the entire property intensively, adjacent properties, dust from the church, and the drainage area. The only positive sample was found again along the edge of the driveway near a garage on adjacent property.

### Geologic and Soils Description

Not available.

MANCHESTER QUADRANGLE  
MISSOURI  
7.5 MINUTE SERIES (TOPOGRAPHIC)

796 III NW  
(GREVE COEUR)

32°30"

490 000 FEET

716

(141)

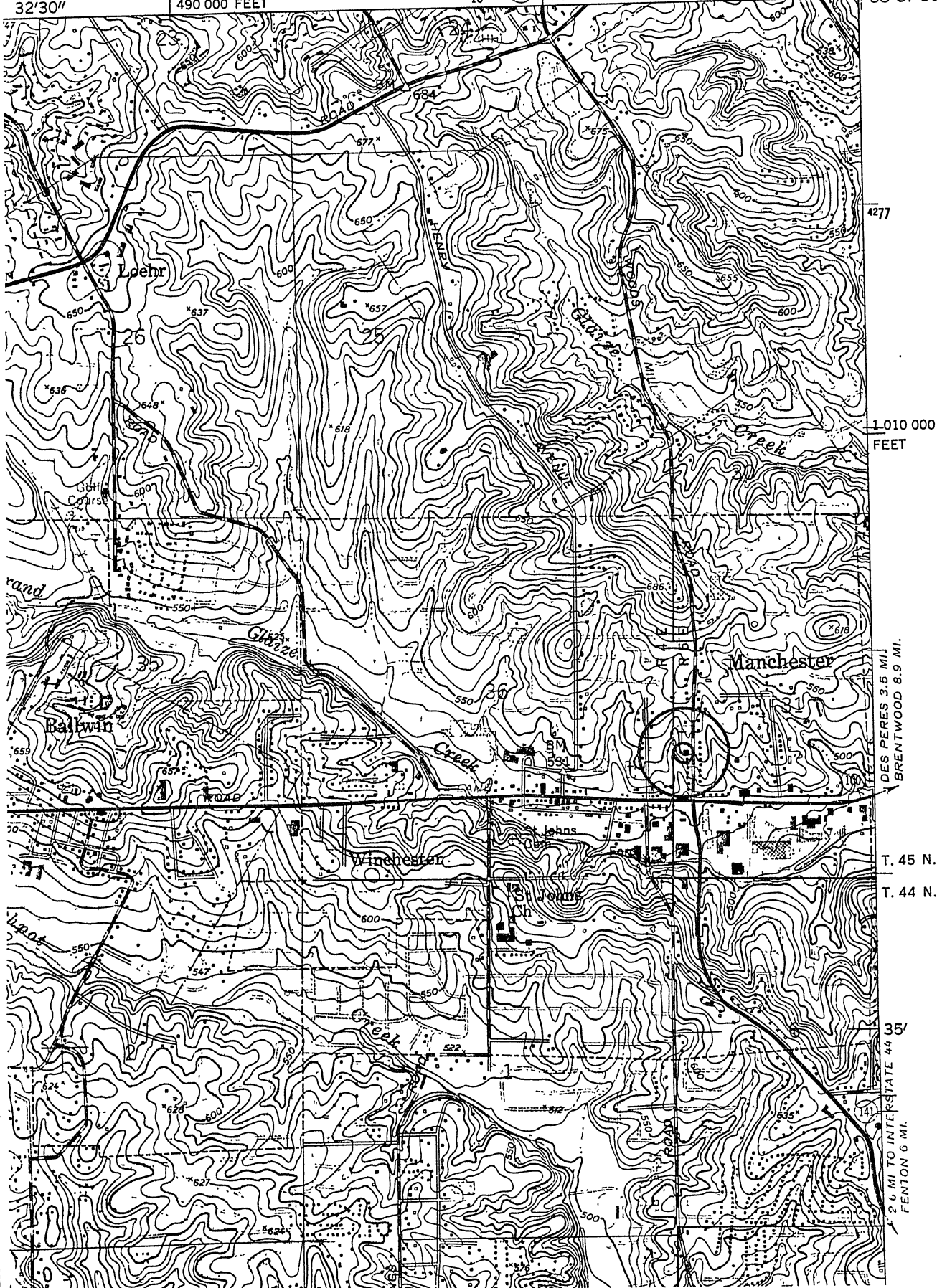
4 MI. TO MO. 340

1.3 MI. TO U.S. 40 & 61

717

90°30'

38°37'30"



1 010 000  
FEET

DES PERES 3.5 MI.  
BRENTWOOD 8.9 MI.

T. 45 N.  
T. 44 N.

35  
2 6 MI TO INTERSTATE 44  
FENTON 6 MI.

WOODS MILL ROAD

CHURCH HOUSE

HOUSE

GARAGE

5-4 pps  
0-6"  
u@6"-24"

30 pps  
0-10"

drainage

METHODIST CHURCH

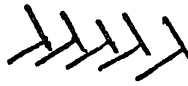
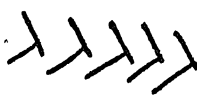
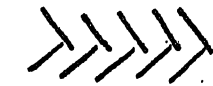
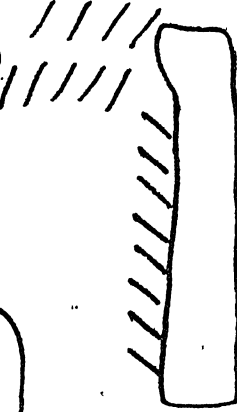
0 25 50 75 100

OPEN FIELD

CHURCH BUILDING

PLAYGROUND

48 pps  
0-8"



## MID-AMERICA ARENA

### Location

Legal Description: SW 1/4, NW 1/4, T. 45 N.,  
R. 5 E., 5th P.M.  
Manchester Quadrangle  
St. Louis County

Address: Ellisville, Missouri

### Accessibility

The site is north of Missouri Highway 100, north off of Strecker Road, along the western boundary of Ellisville.

### History Summary

A large portion of this area, owned by Russell Bliss, and others has been determined to contain hazardous wastes. The areas of concern for 2,3,7,8-TCDD contamination were the horse arena and a drip area beneath the former location of tanks. Records of the Centers for Disease Control show that the drip area was sampled in 1974 with negative results. The horse arena and dust were sampled in 1982 with 2,3,7,8-TCDD being found at 4.8 ppb in dust in the bleachers.

### Site Description (See Map)

The site consists of an outdoor arena, an indoor arena with stables, a parking lot, and other small buildings. The indoor arena was sampled to a depth of 36 inches and found negative at 1 or 2 ppb. A dust sample from the arena rafters was negative. The only positive sample was the dust sample from the bleachers. Sampling of the Bliss and adjacent properties in 1983 found dioxin at 4 other locations. Concentrations range from 5.1 ppb to 120 ppb. The contamination originated from drum and bulk wastes stored on the property, presumably waste oil. At one area, the contamination was found at a depth of 15 to 20 feet, indicating a buried waste. Adjacent residences are as close as 200 feet away. Drainage from the site enters Caulks Creek about 1 mile to the west.

### Geologic and Soils Description

Not available.

4277000m N

4276

4275

4274

T. 45 N.

T. 44 N.

35

WASHINGTON 27 MI.

1.1 MI. TO MO. 109

4272

4271

Clarkson

Valley

657

28

11

700

758

742

718

722

737

755

760

762

764

766

768

770

772

774

Elvasville

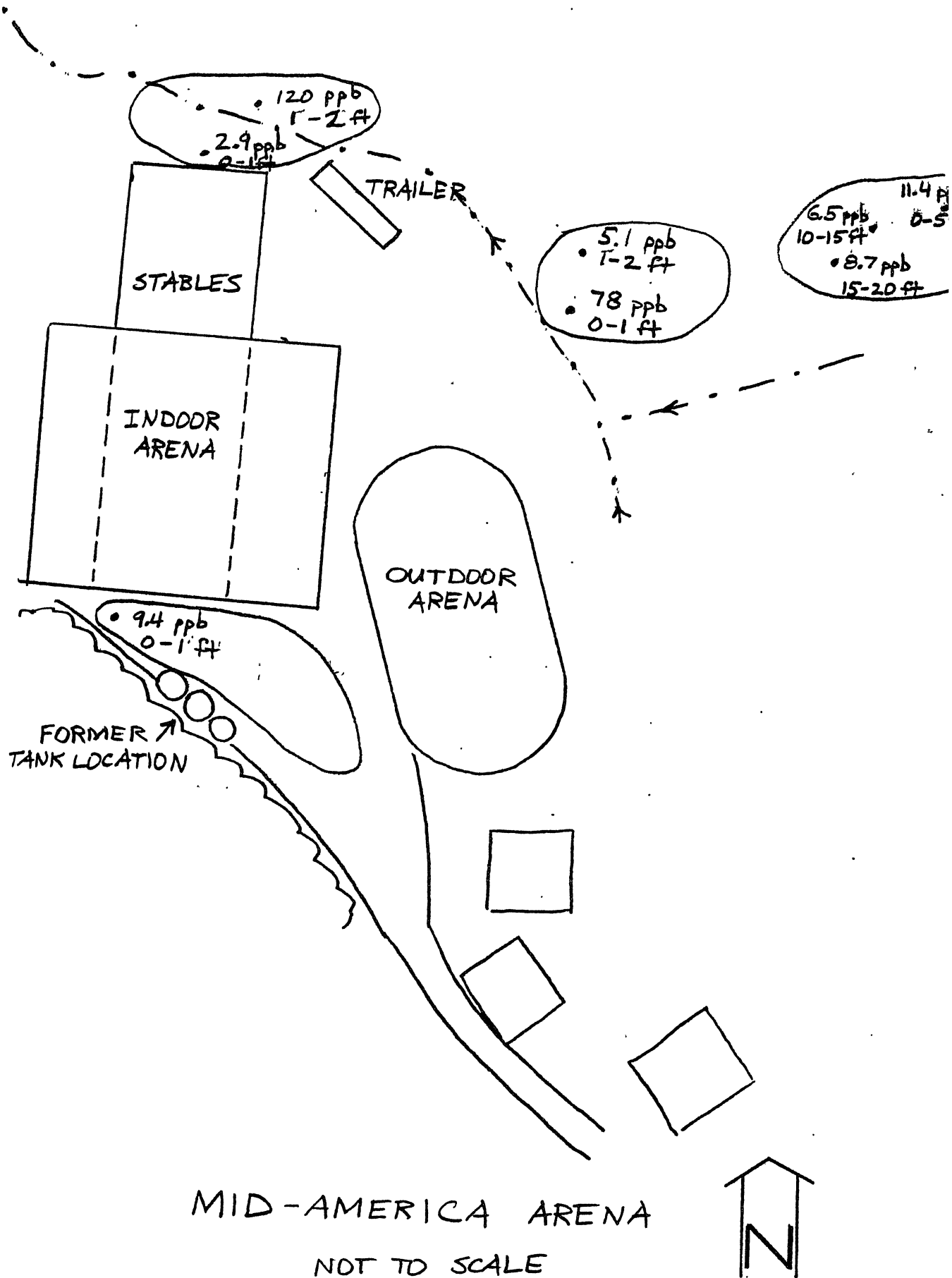
St. Johns

Sch.

MANCHESTER, MO.

N 3830-W9030/7.5







## RUSSELL BLISS OIL COMPANY (FRONTENAC)

### Location

Legal Description: NW 1/4, SE 1/4, NW 1/4, Sec. 13,  
T. 45 N., R. 5 E., 5th P.M.  
Creve Coeur Quadrangle  
St. Louis County

Address: German Boulevard  
Frontenac, Missouri

### Accessibility

The tank storage site lies about 1/2 mile west of Lindbergh Boulevard, a major north-south thoroughfare. The site is bounded by German Boulevard on the north, a store parking lot to the east, and Deer Creek to the south.

### History Summary

This site was used for waste oil storage since at least the early 1960's. The Bliss Oil Co. maintained tanks there during the 1970's until 1979. At one time, six tanks were on the property, used for various oil and flammable liquid products and wastes. In 1976, the ground at the site was so heavily saturated with spilled material that a continuous stream of seepage was entering Deer Creek. During this time there were disputes between Bliss Oil and the City of Frontenac and Metropolitan Sewer District (MSD) regarding the pollution and also litigation in an effort to force Bliss to clean up the site. Two of the tanks were found to have high PCB levels (23 ppm and 400 ppm). Apparently none of the tanks were sampled for dioxin.

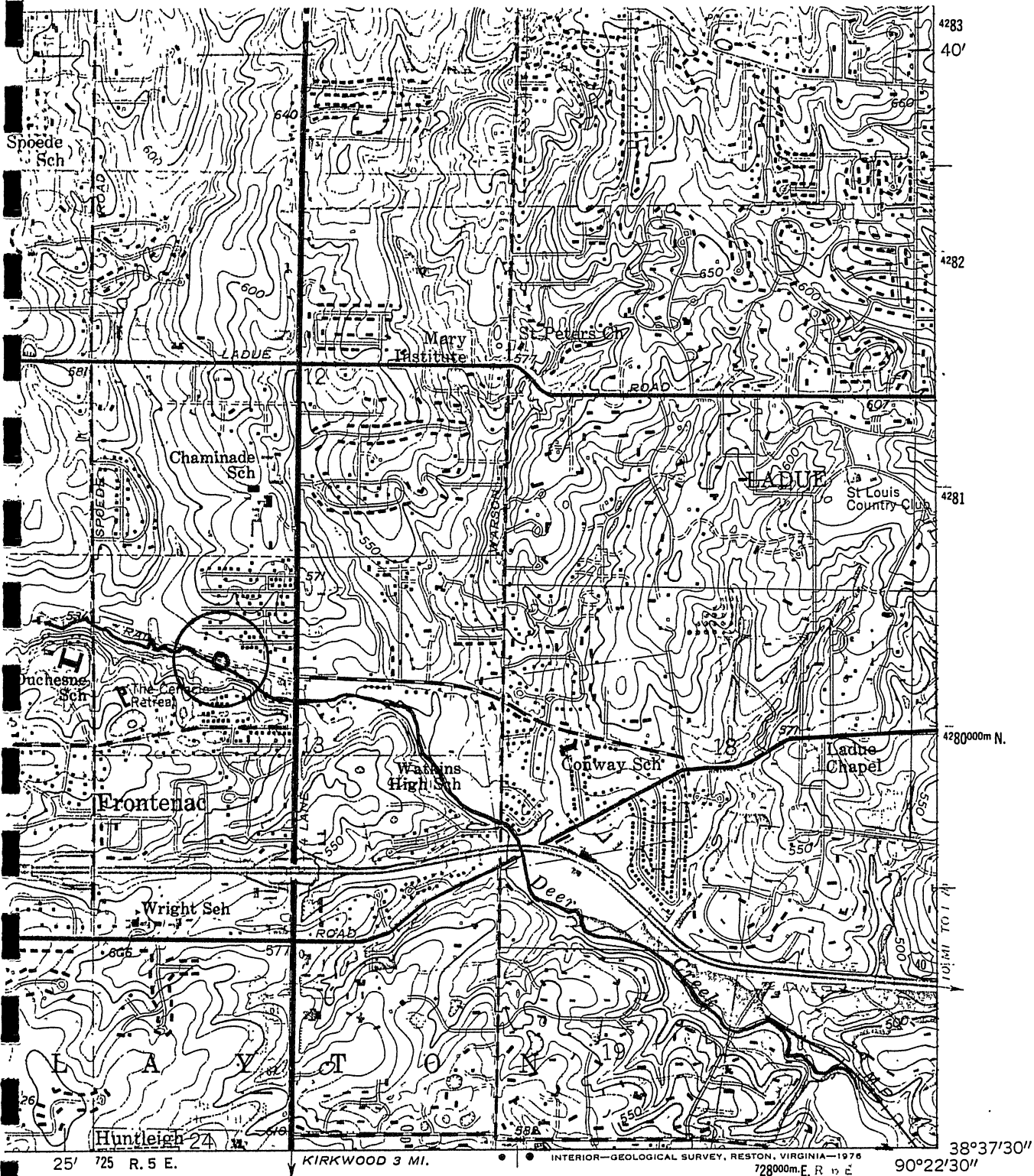
### Site Description

The lot covers about 1/2 acre directly adjacent to Deer Creek. It is covered with 1/2 to 3/4 inch gravel. The area of the former tanks has been found to contain 2,3,7,8-TCDD contamination at a level up to 430 ppb to a 12 inch depth. Greater depth sample analyses are pending. Sampling of Deer Creek sediment and dust from area structures and parking lots were undetectable at levels less than 1 ppb. Parking lots and commercial buildings lie within 100 feet to the north and east. The nearest residence is 250 feet to the northeast.

### Geologic and Soils Description

The former tank farm sits in the Deer Creek floodplain. The native floodplain sediment soils consist of silt loam to silty clay (CL) with some

localized gravel deposits at depths of 5 to 8 feet. The properties of the native soils have been changed by construction and useage in that the permeability is probably reduced in the materials beneath the site. Permeability of the original material would be expected to be on the order of  $10^{-6}$  cm/sec. Permeability of the underlying bedrock varies. Sinkholes are fairly common in the area south of the site. Bedrock throughout the Deer Creek valley; though, is generally less permeable. Movement of contaminated particles through the subsurface into Deer Creek or groundwater would not occur. However, surface erosion is likely to occur.



25' 725 R. 5 E. KIRKWOOD 3 MI.

1 MILE

MISSOURI

QUADRANGLE LOCATION

Revisions shown in purple compiled by the Geological Survey from aerial photographs taken 1968 and 1974

Information not field checked

Print indicates extension of urban areas

ROAD CLASSIFICATION

Heavy-duty	Light-duty
Medium-duty	Unimproved dirt
Interstate Route	U. S. Route
	State Route

(WEBSTER GROVES)  
7961 III SE

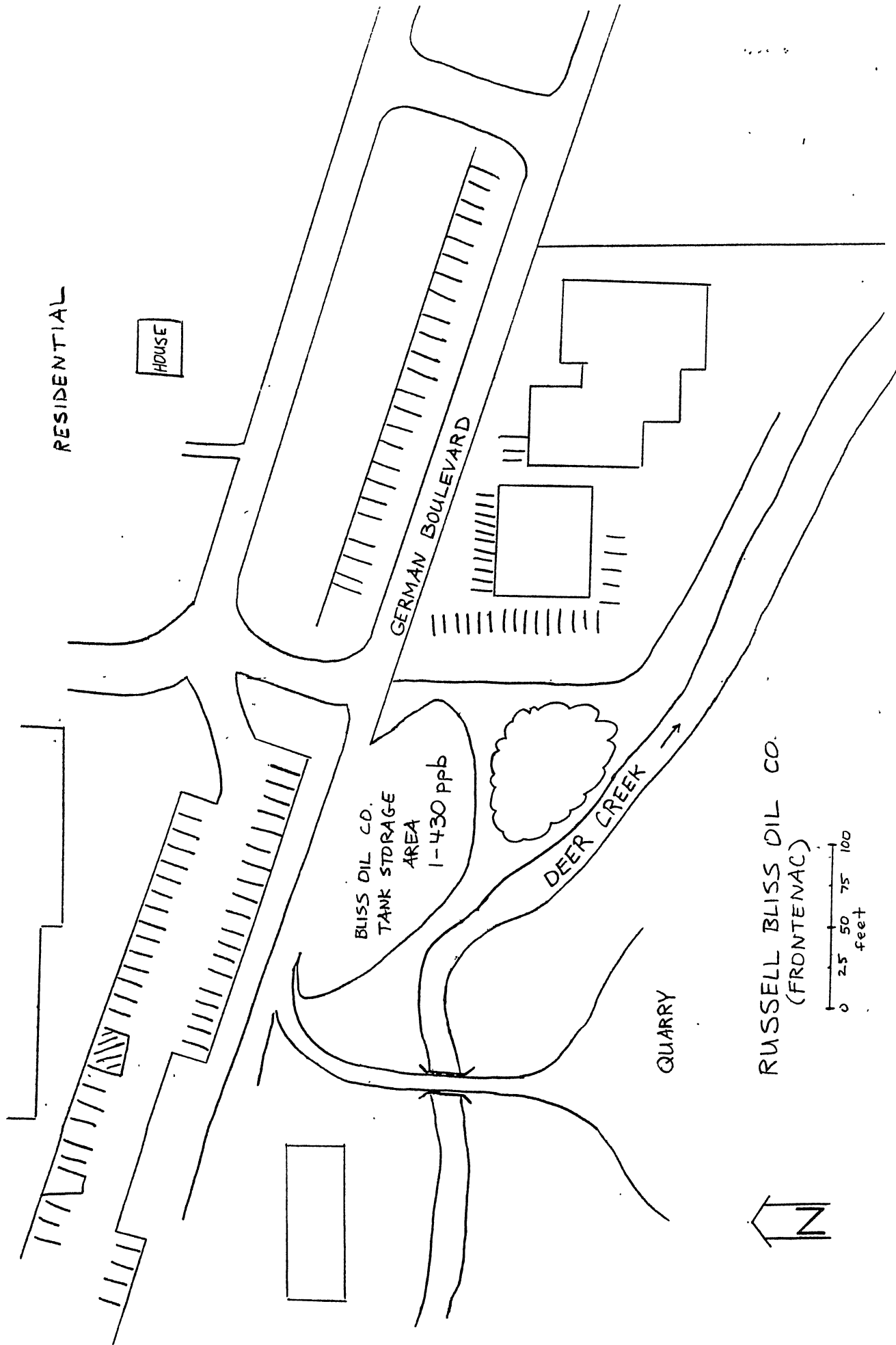
**CREVE COEUR, MO.**

N 3837.5—W 9022.5/7.5

1954

PHOTOREVISED 1963 AND 1974

AMS 7961 III NW—SERIES V879



RESIDENTIAL

HOUSE

GERMAN BOULEVARD

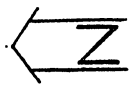
BLISS OIL CO.  
TANK STORAGE  
AREA  
1-430 ppb

DEER CREEK

QUARRY

RUSSELL BLISS OIL CO.  
(FRONTENAC)

0 25 50 75 100  
feet



## SONTAG ROAD

### Location

Legal Description: S 1/2, N 1/2, Sec. 15,  
T. 44 N., R. 4 E., 5th P.M.  
Manchester Quadrangle  
St. Louis County

Address: Ballwin, Missouri

### Accessibility

Sontag Road is in the Castlewood subdivision west of New Ballwin Road, about 1/2 mile south of the intersection of Keifer Creek Road and New Ballwin Road. Take Keifer Creek Road 3 miles south to New Ballwin Road from Highway 100 in Ellisville. Or take New Ballwin Road 2 1/2 miles south from Highway 100 in Ellisville.

### History Summary

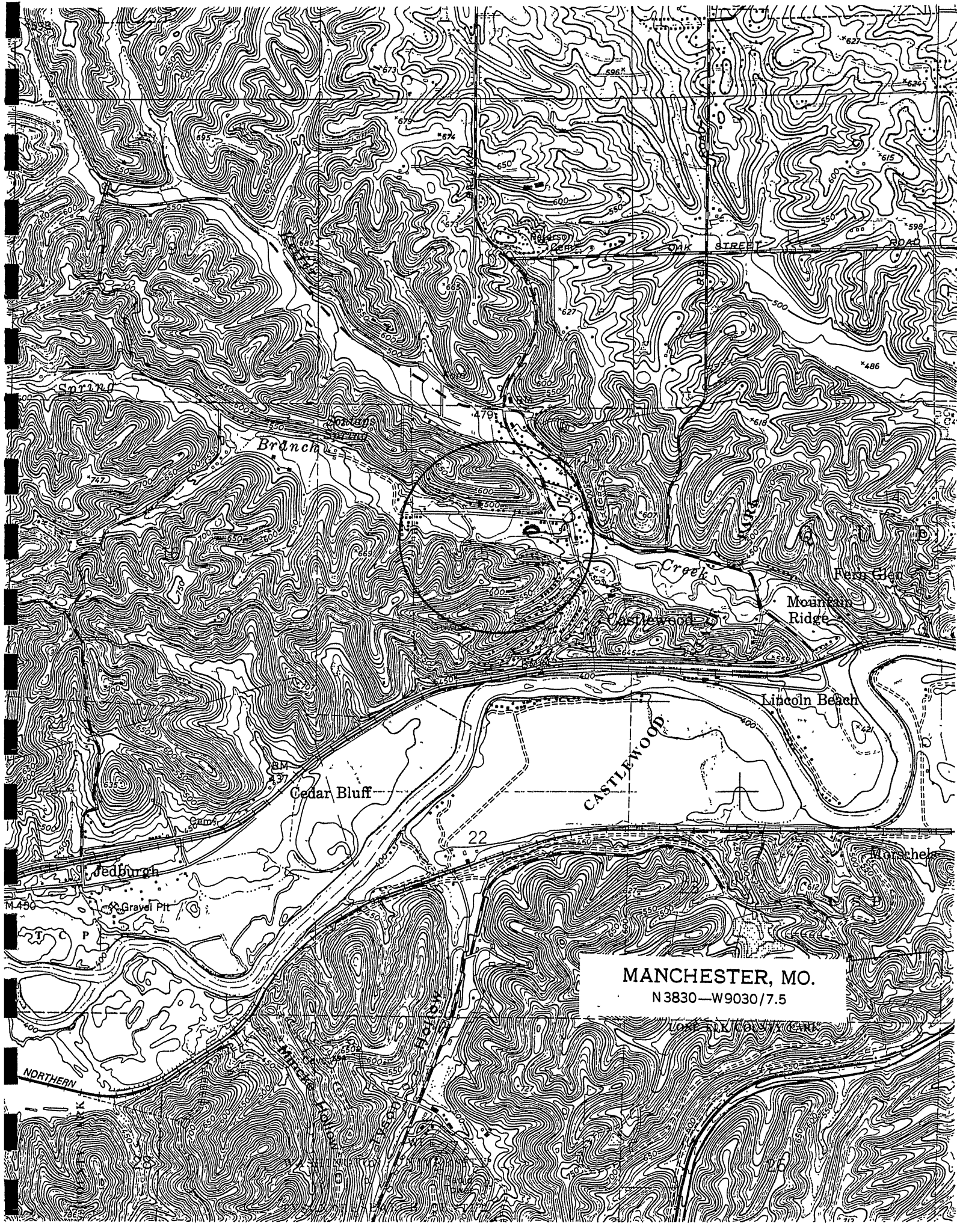
In the early 1970's, Bliss Oil Co. sprayed the two entrance driveways to the Castlewood Swim Club as well as Sontag Road for a distance approximately 2000 feet west from New Ballwin Road. Since that time, the the Road has been paved and the Swim Club has been closed. EPA has begun some temporary remedial action which consists of applying a dust suppressant to road shoulders and gravel driveways, and asphaltting the parking lot of Mel's Tavern, where the highest 2,3,7,8-TCDD levels were found. Also roads, shoulders, and residences will be vacuumed with an air-powered vacuum cleaner.

### Site Description (See Map)

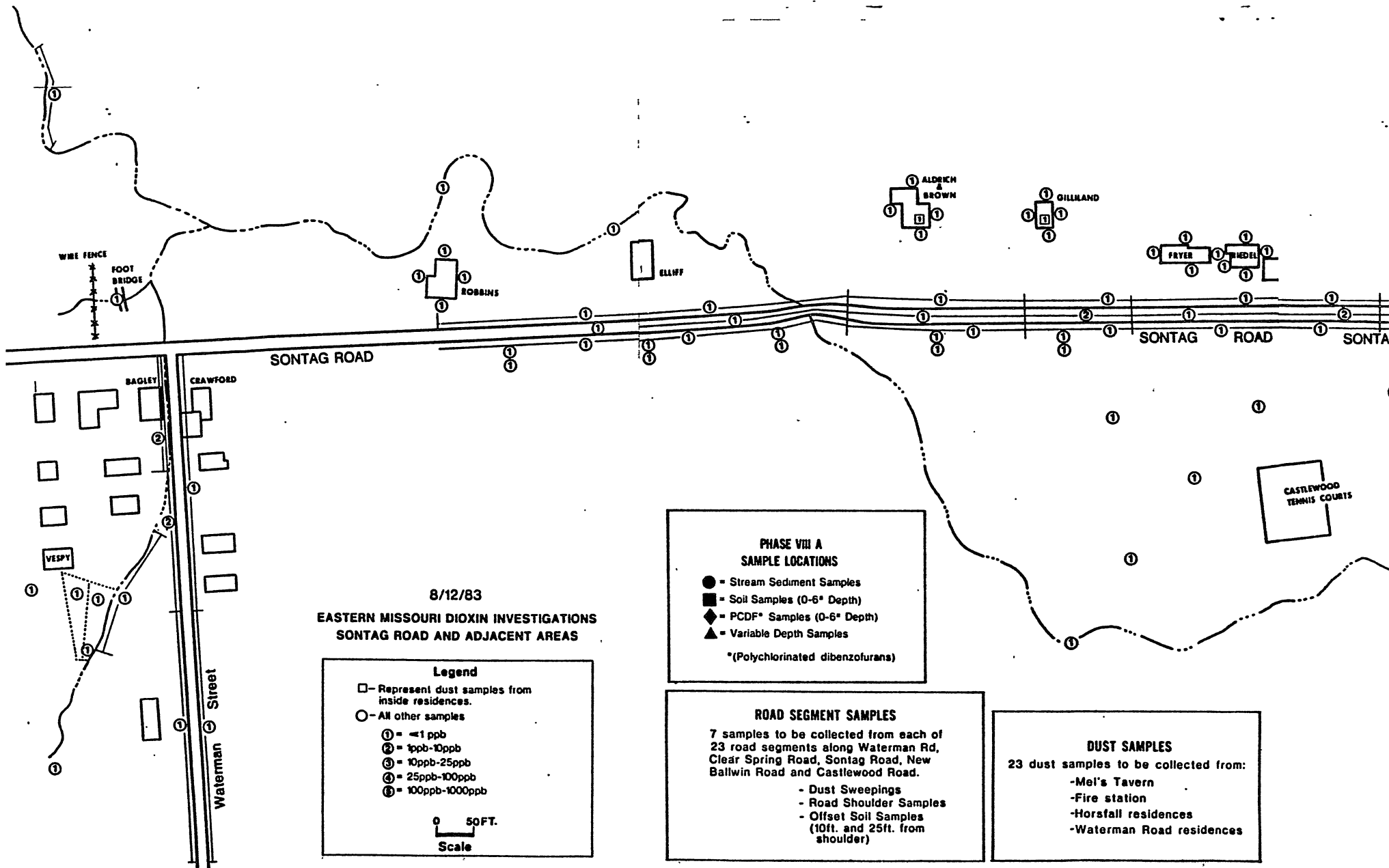
The Sontag Road site consists of Sontag Road, a large number of residences, an abandoned swim club, a tavern, and a fire station. The site sits in the Spring Branch Creek Valley. The affected population within a 2000 foot radius of the swim club is about 700. The site map shows the results of the fairly intensive sampling done.

## Geologic and Soils Description

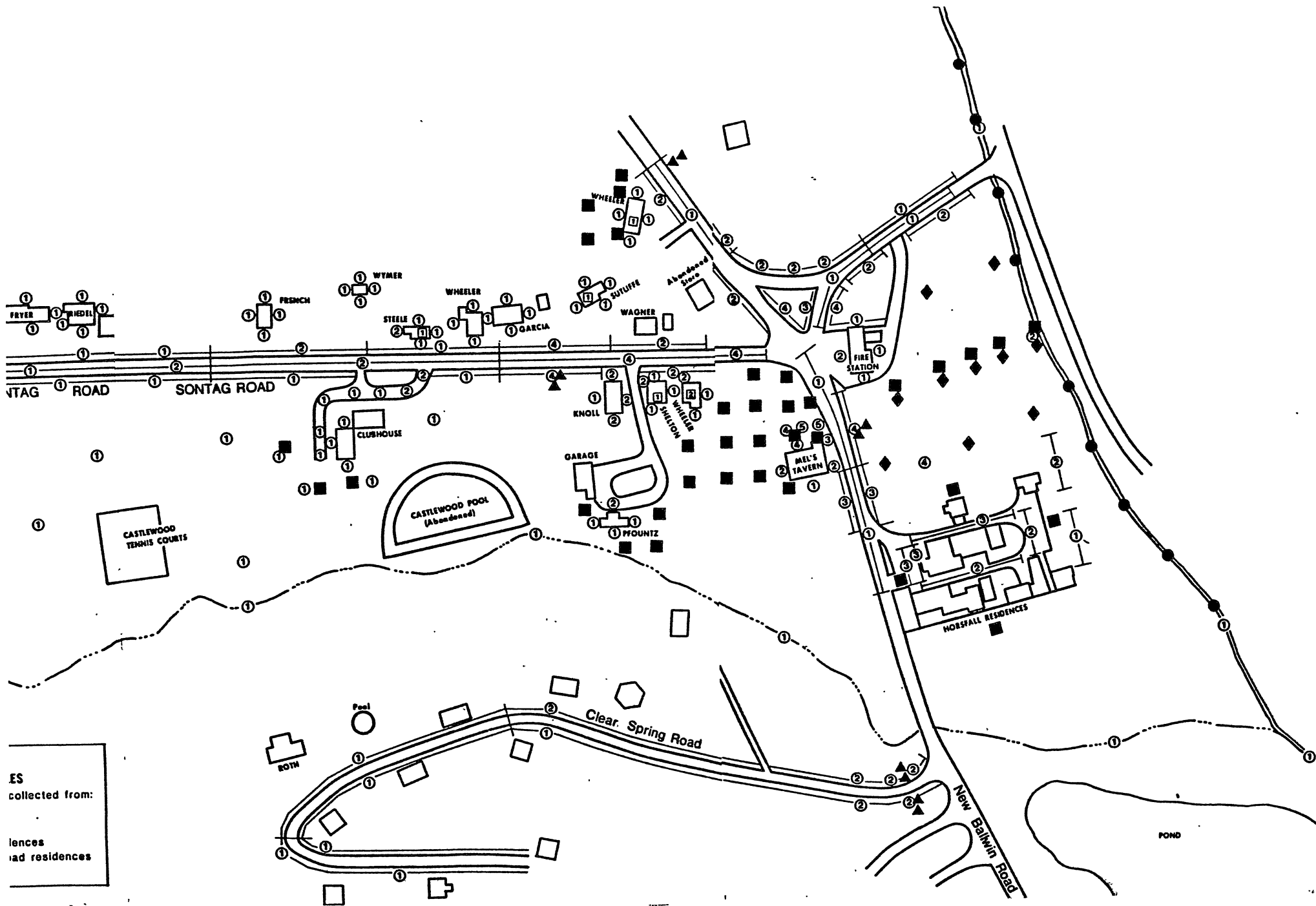
The area sits just upstream of the confluence of Spring Branch and Kiefer Creek and about 1 mile from the Meramec River.. Sontag Road lies in the floodplain of Spring Branch Creek, a gaining stream. Soil in the area is a silty clay underlain by a gravelly silty clay with some sand. Surface soils are characterized as having moderately rapid permeability. The soil is listed as having severe limitations for constructing dikes, levees and embankments due to seepage and eroding easily. Bedrock would be limestone of the Kimmswick formation possibly overlain in some areas by a thin calcareous shale called the Maquoketa formation.



MANCHESTER, MO.  
N3830—W9030/7.5







## SOUTHERN CROSS LUMBER COMPANY

### Location

Legal Description: T. 46 N., R. 6 E.  
Florissant Quandrangle  
Latitude: 38° 45' 44"  
Longitude: 40° 21' 47"

Address: Hazelwood, Missouri

### Accessibility

The site sits north of McDonnell Parkway (County Road TT), between Byasse Drive and Lindbergh Boulevard (Highway 67). The contaminated roads are all within the Lumber Company complex.

### History Summary

According to company employees, roads on the lumber yard were oiled several times in the early 1970's by Bliss Waste Oil Service. The roads were in the main yard and the adjacent 3 and 11 acre lumber storage areas. It was estimated that about 30% of the 3 and 11 acre areas were oiled, or about 2 1/2 miles of road. Initial EPA sampling found 2,3,7,8-TCDD levels up to 27.3 ppb. Additional sampling has not been completed.

### Site Description (see map)

The site consists of three separate areas, in which a total of ten samples were taken. The areas are: 1) the unloading and delivery area and office building, 2) the McDonnell Boulevard yard, and 3) the Byasse Street yard. All samples were taken between 6 inches and 18 inches, as the site was covered with gravel after oiling. The site sits just north of the Lambert Airport and is surrounded by other commercial and industrial establishments.

### Geologic and Soils Description

Not available.

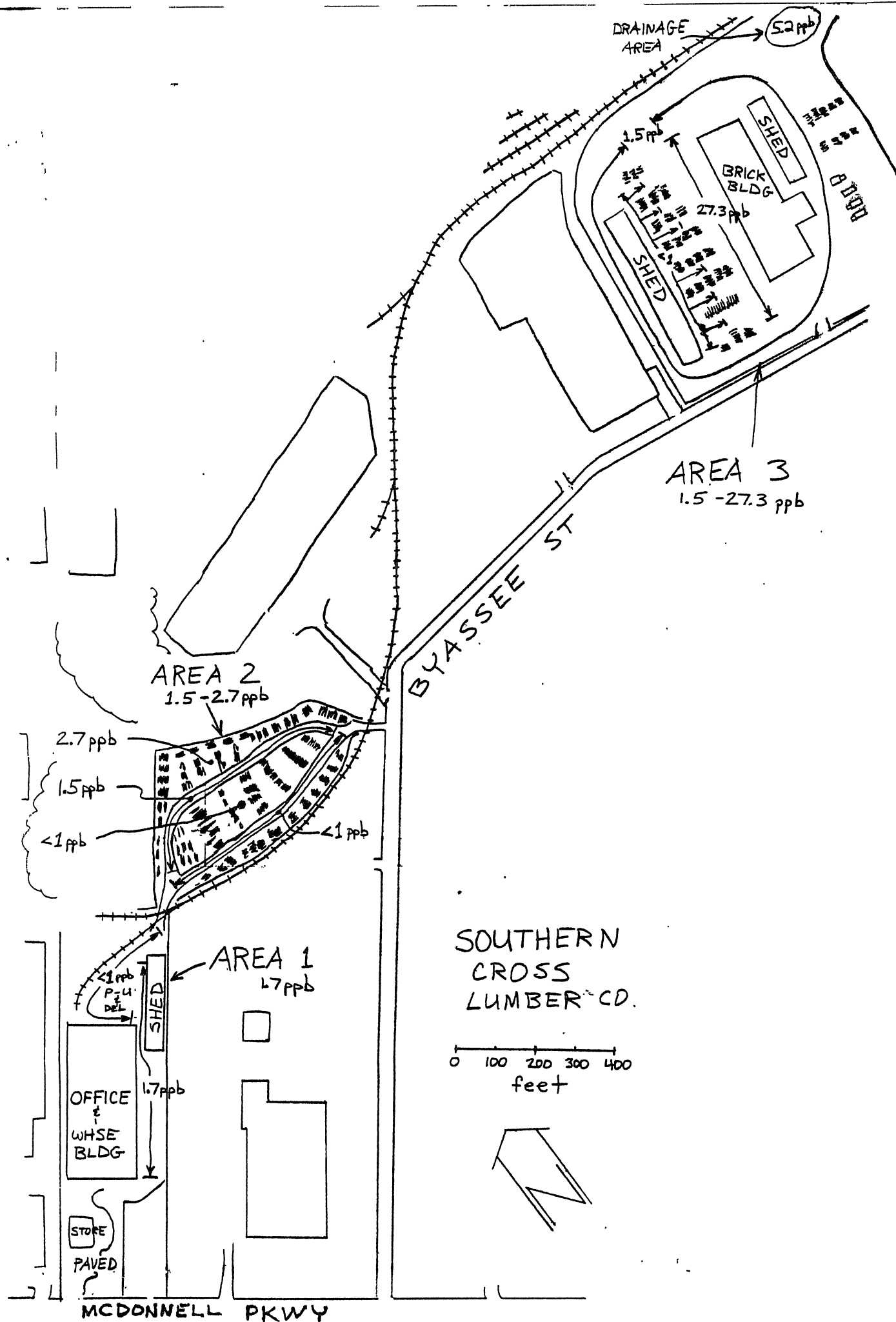


FLORISSANT, MO.

SE/4 ST. CHARLES 15' QUADRANGLE  
N 3845-W 9015/7.5

Mapped by the Army Map Service  
Published for civil use by the Geological Survey

COEUR  
NW



## TIMES BEACH

### Location

Legal Description: Floodplain of the Meramec River, principally W 1/2, Sec. 32, and E 1/2, E 1/2, Sec. 31, T.44 N., N., R. 4 E., 5th P.M. Manchester Quadrangle St. Louis County  
Latitude: 38° 30' 33"  
Longitude: 90° 36' 08"  
Population 2,061

### Accessibility

Times Beach can be entered by any of three routes. Interstate 44 exits onto a northern outer road which goes into the City. Lewis Road from the north also connects with the I-44 outer road. The third access route is from the City of Eureka south of I-44 onto Times Beach Service Road.

### History Summary

In June 1972, a city ordinance was passed to contract with a waste oil hauler to spray the roads for dust control. Apparently all of the gravel streets were oiled that summer twice and a third time where needed, as recalled by residents. In 1973, the roads were again sprayed by contract. The agreement was to have approximately ten miles of road oiled. Five additional streets had been paved so less oiling was done that year. EPA sampled the roads and right-of-ways in November and December 1982, and found 2,3,7,8-TCDD levels up to 127 ppb. In December 1982, the Meramec River flooded the town. EPA sampling in January 1983 following the flood showed that the contaminated soil remained quite immobile throughout the flooding. On February 22, 1983, the EPA Administrator announced a \$33 million pledge from superfund to purchase the Times Beach property under a relocation plan to be developed and implemented by the Federal Emergency Management Agency (FEMA). EPA is planning to have a feasibility study conducted to determine the scope and costs of cleanup alternatives. The city is on the National Priorities List.

### Site Description (see maps)

Times Beach is principally bounded by the Meramec River, Interstate 44, and the Burlington Northern Railroad tracks. Being in the 100-year floodplain, the area is relatively flat. The majority of the city's 28 miles of paved and gravel road, shoulders, and ditches are contaminated. Maximum levels of 2,3,7,8-TCDD are shown on the city map. Contamination has been found down to at least two feet below the surface. The City of Eureka, population 3,862 lies immediately to the south and west of Times Beach. None of Eureka's streets were oiled and no contamination has been found within the city. Results of all groundwater sampling in the area have been negative.

### Geologic and Soils Description

Times Beach is on an alluvial setting, underlain by alluvial silt to a depth of more than 5 feet. Below the alluvial silts; sand, gravel, and a mixture of silt, sand, and clay would be expected to a depth of from 40 to 50 feet where bedrock is encountered. The water table would be expected to be about at the Meramec River level, between 10 and 20 feet from the surface in most of the area.

The alluvial silt has a relatively low permeability and would be expected to be wet natured in that it does not readily or rapidly drain water. Due to this and the screening effect of the silt, it is not likely that soil particles contaminated with dioxin would move down into the water table.

It can be assumed that the contaminated material consists of road bed material plus native soil where the contamination has eroded into the ditches.

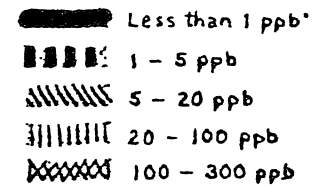


# TIMES BEACH, MISSOURI

## U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 7 - KANSAS CITY

Pre-Flood and Post-Flood Dioxin Analysis  
283 of 369 Samples Available as of 2/4/83  
Quality assurance has not been completed  
for these values

### LEGEND

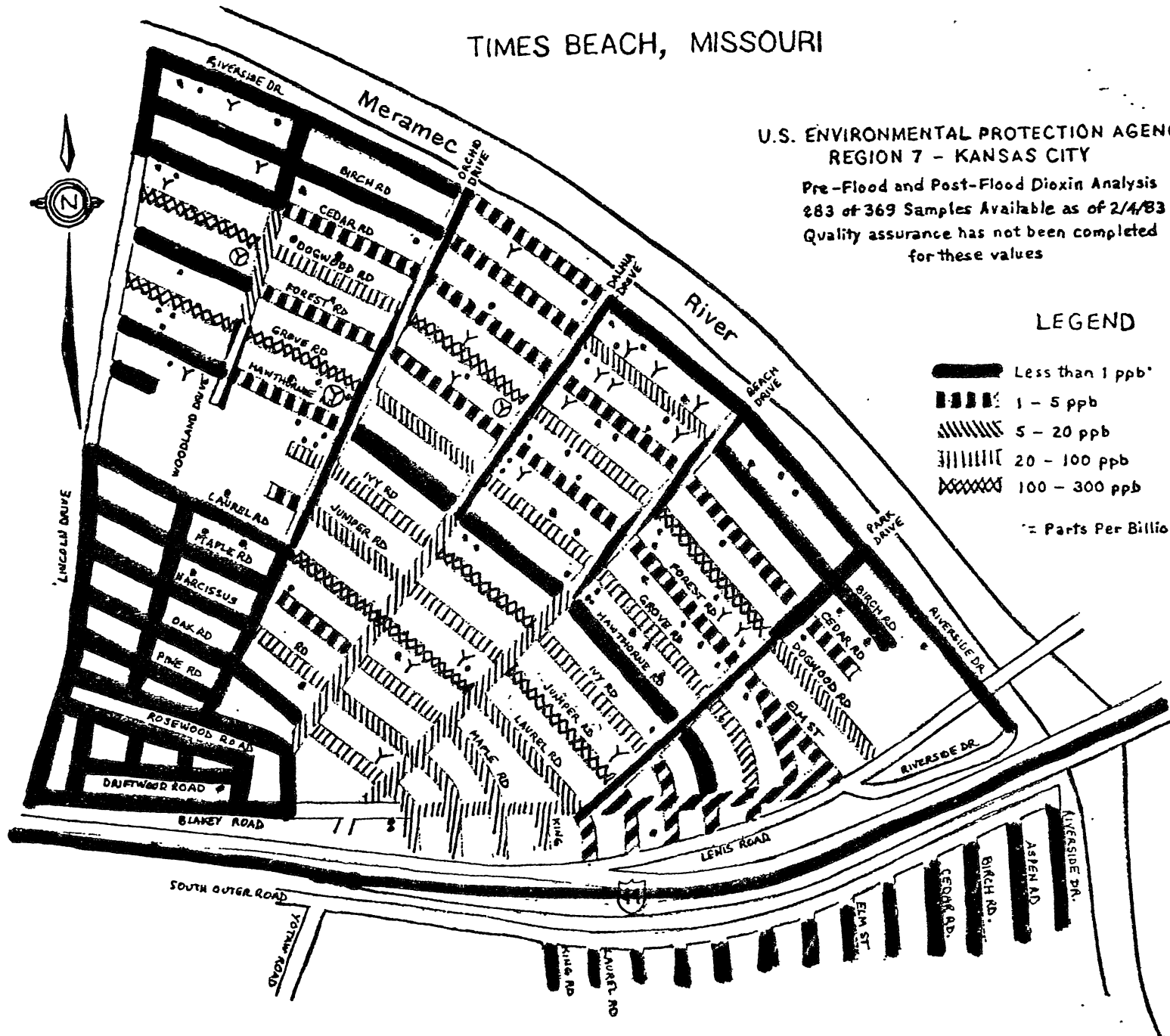


= Parts Per Billion

• Houses Sampled

Y Yard Sample

⊙ Dioxin DETECTED  
< 5 PPB





## APPENDIX V

### MISSOURI DIOXIN HEALTH STUDIES PROGRESS REPORT

October 16, 1983

#### EXECUTIVE SUMMARY

This interim progress report consists of two parts: (a) An overview of the public health response activities to the 2,3,7,8 - tetrachlorodibenzo-p-dioxin (TCDD) environmental contaminations in Missouri, prepared by the Center for Environmental Health, Centers for Disease Control (CEH/CDC) and the Missouri Division of Health (MDH); and (b) a report on the pilot epidemiologic study of health effects due to TCDD contaminations in Missouri. The report of the pilot study was prepared by the above two agencies and the participating co-workers from the Departments of Medicine at St. Louis University School of Medicine, St. Louis, and St. Joseph Hospital, Kirkwood, Missouri.

In 1971, waste oil containing TCDD was sprayed for dust control on residential, recreational, and work areas in Missouri. For many of these areas, the presence, magnitude, and extent of environmental contamination was not documented until late 1982 and new information is being developed daily. The first document in this progress report includes an overview of the environmental TCDD contamination in Missouri, a summary of the risk assessment process used to recommend what concentration of TCDD in soil in residential areas should raise a level of concern for human health, and an outline of the initial activities undertaken by MDH and CEH/CDC. The public health activities included: close collaboration with the Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (MDNR) on review and evaluation of environmental data, the development of health advisories to be used by EPA in considering remedial or preventive actions at specific contaminated sites, a health education effort for the medical community and general public, a dermatologic screening clinic, establishment of a central roster of potentially exposed individuals, administration of a questionnaire survey, and a pilot medical-epidemiologic study of a group of individuals at "highest risk" of exposure carried out in early February 1983.

The purpose of the pilot medical-epidemiologic study was to provide perspective on the types of problems (i.e., symptoms on medical history questionnaire, findings on physical examination, and results of laboratory tests) present in a group of individuals with high risk of environmental TCDD exposure. The preliminary information on possible health effects from these exposures provided by the pilot study would enable medical epidemiologists to develop more refined and specific epidemiologic protocols to be used in further evaluations. Pilot studies by their nature are an initial probe to obtain an early impression of the types of problems being seen and thereby bring a problem into better focus and help direct future activities. Pilot studies are not by their nature meant to resolve all, or even the majority of, questions pertaining to a specific problem.

In this instance, the pilot medical-epidemiologic study was undertaken because many uncertainties were initially apparent in the Missouri dioxin situation. These uncertainties mitigated against a quick, simple design of a definitive health study. These uncertainties included: (a) very limited data on the types of health effects to be expected, with many potential effects to be evaluated, but very few known effects which are unique to dioxin exposure; (b) the limited, but rapidly emerging, environmental data at the time of planning this study, thus a quick and rigorous classification of exposure status for large study groups was precluded; (c) the unavailability of a direct measure of exposure (such as a TCDD blood level) for comparison with health findings in a study; and (d) the distribution of most highly exposed individuals among a number of different sites and settings.

Within the constraints and limits noted above, and with a resulting sense of caution, the following summary of the pilot survey is provided. With regard to the previously reported effects most closely associated with dioxin exposure, no cases of chloracne or porphyria cutanea tarda (or precursor stages of the latter) were documented. With regard to the large number of clinical tests for the organ systems suggested to be most sensitive to TCDD exposure (e.g., the liver), as well as the large number of tests of other systems and functions in the study, the results are largely negative, i.e., the majority of test results did not show an association with TCDD exposure status. The overall impression of negative results is based on three lines of reasoning: (a) There were very few statistically significant differences in these clinical tests between the high and low risk groups, (b) the group as a whole showed few clinical abnormalities and there was not a pattern of findings suggesting consistent trends of increased abnormalities in the high risk group, and (c) for specific areas (e.g., tests of liver function) multiple tests were consistent in not demonstrating abnormalities.

While these overall, first observations are encouraging and are not indicative of significant, dioxin-related effects in this pilot study population, several points should be kept in mind: (a) Inconclusive results should be evaluated in further studies; (b) subtle health effects could possibly have been missed; (c) certain areas, such as psychological or behavioral function, were not evaluated in this pilot study; and (d) some degree of exposure misclassification of individuals could have occurred.

Consistent with our original purpose, however, MDH and CEH/CDC are developing protocols for further evaluation of groups thought to be exposed to TCDD in an attempt to provide more definitive conclusions. Efforts are also underway to develop the laboratory techniques to provide a direct measure of TCDD exposure (e.g. serum TCDD analyses) which would be helpful in providing accurate classification of exposure status.

It would be unwise to extrapolate from these preliminary findings to other possibly TCDD exposed groups in or outside of Missouri. Such extrapolation may be possible after more definitive studies of both health effects and dioxin exposure status are available.

Finally, public health policy in situations such as this environmental contamination with TCDD must continue to be focused on the prevention of any potential health effects even if such effects were not demonstrated in a small pilot study. Health effects could occur with a latency period exceeding the time from initial exposure to examination in this study. For this reason, all appropriate efforts need to be made to prevent human exposure.

## APPENDIX VI

The Task Force wishes to acknowledge the assistance and support of the following people, and thank them for providing a multitude of information during the last 8 months.

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